

# Compressed Air

FEBRUARY 1955

## *Magazine*



SKYLINE ON TIP  
OF MANHATTAN  
Some of New York's famous  
structures as seen from  
under Brooklyn Bridge

PHOTOGRAPH, J. DEYANBY, N. Y.

VOLUME 60 • NUMBER 2

NEW YORK • LONDON



# ALL AIR COMPRESSORS WORK BETTER

**WHEN** *Texaco Regal Oil R&O* is the compressor lubricant, you can count on: 1) clean, rust-free systems and lines, 2) free piston rings to assure top efficiency, 3) valves that seat properly for trouble-free performance. Your air compressors work better, their maintenance costs are lower.

*Texaco Regal Oil R&O* is a premium quality oil. It is scientifically refined from choice base stocks, then its na-

turally fine qualities are further improved by effective additives and extra processing.

There is a complete line of *Texaco Regal Oils R&O*. Thus, you can be sure of one perfectly suited to your compressor—whatever its size or type, whatever the number of stages or pressure involved, whatever the operating conditions.

A Texaco Lubrication Engineer will gladly help you choose the one that assures superior performance. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



**TEXACO Regal Oils R & O**  
FOR ALL AIR COMPRESSORS AND OPERATING CONDITIONS

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE or DONALD O'CONNOR, on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Circle 1A on reply card



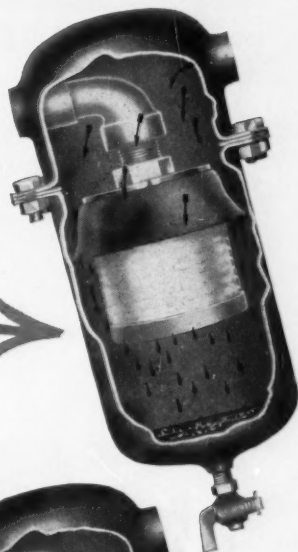
# STAYNEW FILTERS' DOUBLE ACTION

## Guards Against Water, Oil and Pipe Scale

### MECHANICAL SEPARATION

1.

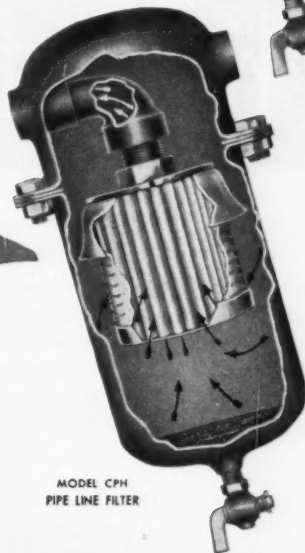
Deflector cup directs flow of air or gas together with water, oil and dirt to the walls of the housing and then downward at high velocity into the base where liquid and heavier dirt particles are deposited.



### FILTRATION

2.

Air or gas, having been mechanically cleaned, rises at low velocity through the Radial Finned Filtering element or insert which removes the lighter air-borne material.



This exclusive Double-Action principle of Staynew Pipe Line Filters assures sustained, trouble-free operation. Inexpensive, quickly installed and easily maintained, these filters keep air operated or controlled equipment free from pipe scale, dust, dirt, and condensate. Wherever you require air and other gases *clean and dry*—demand and get—Staynew Pipe Line Filters.

Write today for complete Staynew Pipe Line Filter Bulletin B-1A.

Representatives in Principal Cities



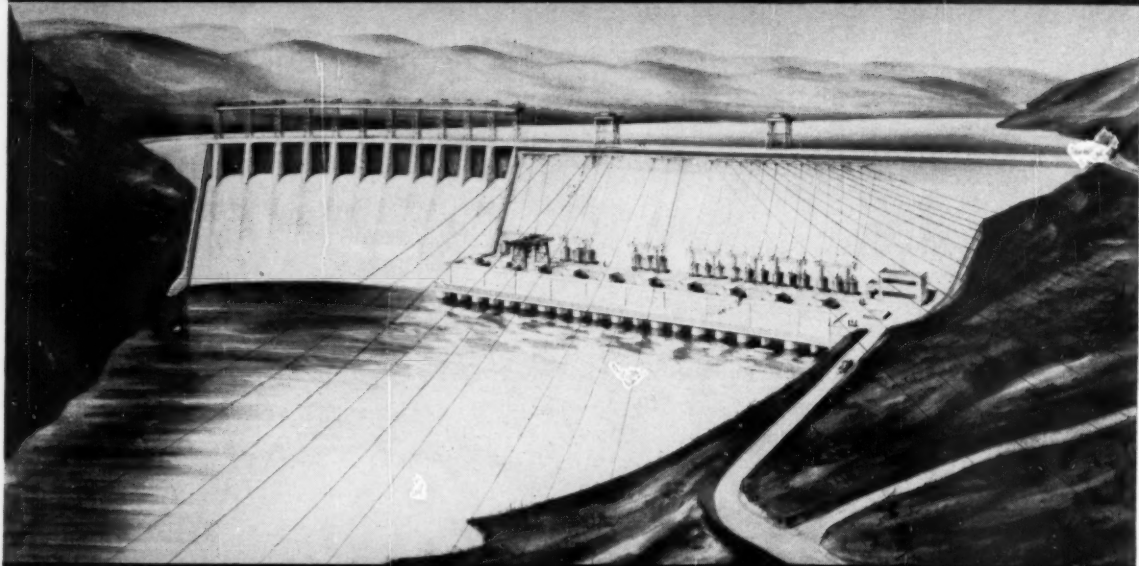
# DOLLINGER

CORPORATION

7 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

# drilling for 400,000



# KW of electricity...

Some 200 miles north of Sao Paulo, Brazil, Ebasco Services is engineering and constructing the Peixoto Hydro Electric Development, for Cia. Paulista de Forca e Luz. When completed, the harnessed waters of the Rio Grande will furnish 400,000 KW of electricity for the industrial development of the area.

To build the dam and accessways to it, meant moving many hundred tons of earth and rock — and for that big job Crucible Hollow Drill Rods were chosen. Experienced construction men *know* they can depend upon these rods for *optimum* performance at *lowest cost per foot of hole drilled*.

That's because Crucible Hollow Drill Rods are built to *tool steel* standards, by the leading producer of tool and special purpose steels. That means fewer broken rods or valuable bits lost on the job. So be sure that on your drilling jobs you specify Crucible Hollow Drill Rods. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

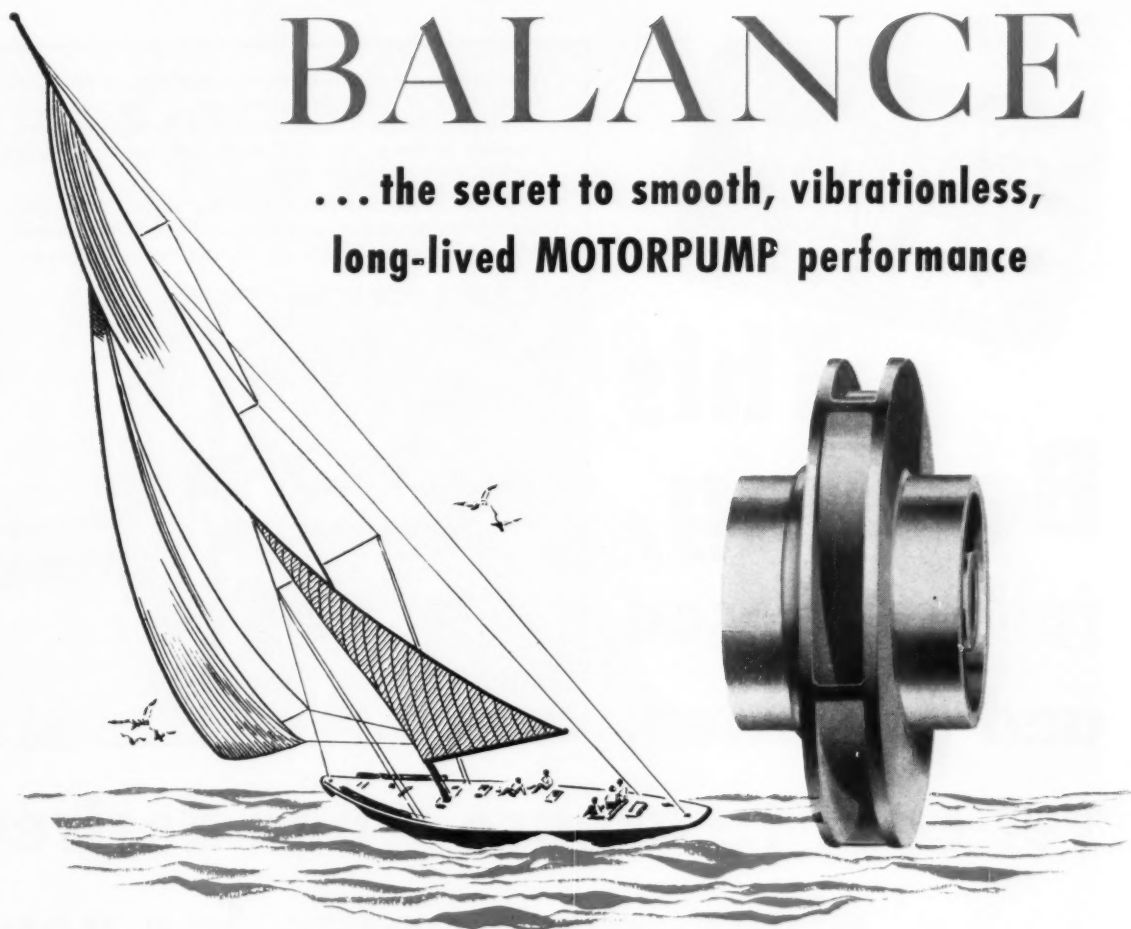
**CRUCIBLE**

first name in special purpose steels

## Crucible Steel Company of America

# BALANCE

... the secret to smooth, vibrationless,  
long-lived **MOTORPUMP** performance



## MECHANICAL BALANCE

Is achieved by an even distribution of metal in the impeller, which keeps the radial load on the bearings and shaft at a minimum. The impeller of I-R Motorpumps is subject to critical balance tests to insure smoothness, quietness, freedom of vibration. These tests are your assurance of efficient pump performance, long trouble-free operation, a minimum of wear on close running parts.

## HYDRAULIC BALANCE

In the Motorpump contributes materially to long-life and low maintenance. The engineered use of a balancing orifice stabilizes the forces acting axially on the impeller. Hydraulic balance, thus achieved, lowers the thrust load on the bearings and increases the life of the pump. It also keeps stuffing-box pressure low, which lengthens packing or seal life and reduces maintenance.

**B**ALANCE is a law of nature which creates orderliness amid strong opposing forces. Without it there can only be swift moving forces that lead to destruction. That's why *balance* is always uppermost in the minds of I-R designers and engineers.

Balance . . . careful design . . . these hold the secret to volume flow through *small* units. This explains why Ingersoll-Rand Motorpumps are so efficient . . . why I-R Motorpumps so often outperform other pumps of the same size.

Ingersoll-Rand Motorpumps are available **FOR IMMEDIATE SHIPMENT** in sizes from 1/4 to 75 hp. Call our nearest branch office or write direct.



## Ingersoll-Rand

975-9

11 Broadway, New York 4, N. Y.



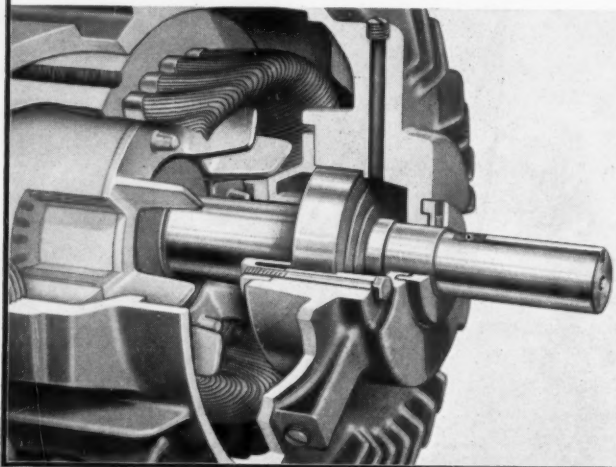
**ALLIS-CHALMERS**  
**Totally-Enclosed**  
**Fan-Cooled**  
**MOTORS**

**This**  
**Bearing,**  
**fully enclosed**  
**and protected,**

**yet easy to grease when desired**  
**...gives more value for your**  
**motor dollar**

The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.



Lubricate without dismantling motor. Pipe-tapped holes in the bearing housings at two points provide both means for inserting new grease and a means of flushing out old grease.



**Look for the extra bolts** on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7225.

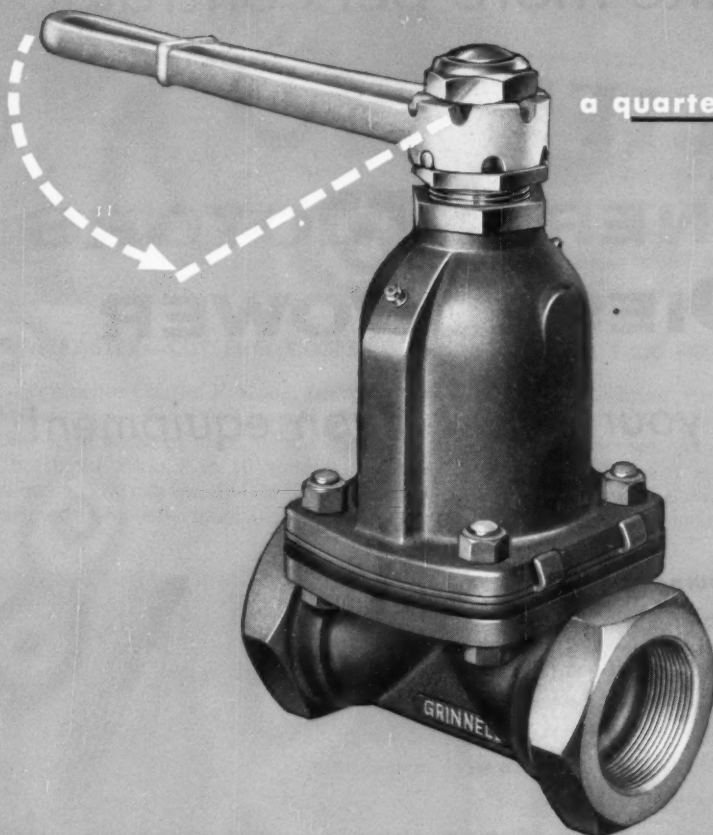


**ALLIS-CHALMERS**



A-4575

## Newest...and Fastest in Compressed Air Control Valves



a quarter turn does it!

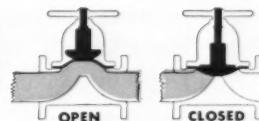
## Grinnell-Saunders Diaphragm Valves

Only *one quarter turn* of the control lever is needed to close or open the new QUICK-ACTING Grinnell-Saunders Diaphragm Valve. The lever actuates a shaped cam that lowers or raises the valve stem smoothly and with relatively little effort. Easy operation is secured by careful design of the cam surfaces, to apply increasing force as the resistance to closure increases.

In the smaller sizes, this new valve is ideal for air-operated tools, presses, clamps, molds, or wherever fast control is requisite. In the larger sizes it supplies quick control of air agitators, or large headers at compressors where speed may be a factor in safety.

All of the established and outstanding features of Grinnell-Saunders Diaphragm Valves are retained: complete isolation of all working parts, leak-proof closure, a high lift for full streamline flow, freedom from clogging, a choice of diaphragm materials resistant to oil and to most chemicals, body linings to suit the required service, and easy maintenance.

For further details, write for Grinnell-Saunders Diaphragm Valve catalog.



Grinnell Company, Inc., Providence, Rhode Island

Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves  
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies  
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

Like these contractors, you can

**Bid lower- Finish jobs faster-  
make more per contract**

**SPECIFY**

**GENERAL MOTORS  
DIESEL POWER**

In all your construction equipment

**"Works faster... burns less fuel...  
costs less to maintain."**

That's what these contractors—operating *seven* different kinds of General Motors Diesel-powered equipment—report about their GM Diesels. They've got on-the-job proof that a GM 2-cycle Diesel does more work at less cost on every construction job.

If your business is building anything from sewers to skyscrapers, you'll find a good way to build your business is to *specify* a GM Diesel when you buy equipment.

For this quick-acting 2-cycle Diesel accelerates faster under load, burns fewer gallons of low-cost fuel, stands up better even in toughest working conditions. You won't need service often but, when you do, your GM Diesel distributor backs up engine performance with fast service and quick delivery of low-cost parts, no matter where your contracts take you.

Today you can get GM Diesel power in over 750 different models of equipment built by more than 150 different manufacturers. Get their names from your local GM Diesel distributor or write direct for the list.

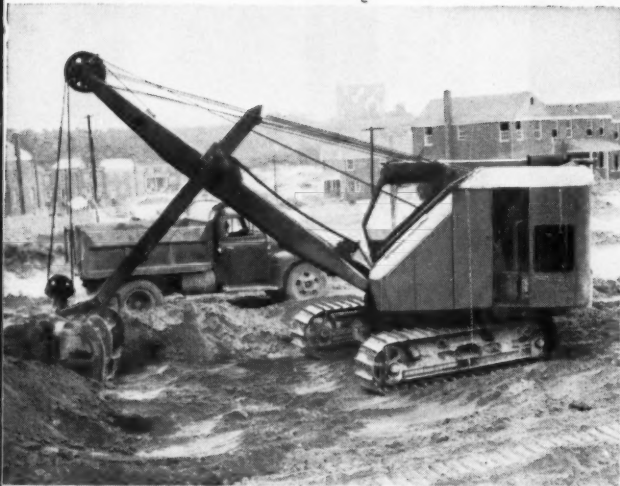


**25% MORE WORK AT HALF  
THE FUEL COST**

California contractors McGuire & Hester report they're getting 25% more work—and spending 50% less for fuel—since they converted this  $\frac{3}{4}$ -yard dragline from gasoline to General Motors Diesel power. The compact "4-71" GM Diesel did such a good job that the contractor repowered two more shovels with GM Diesel.

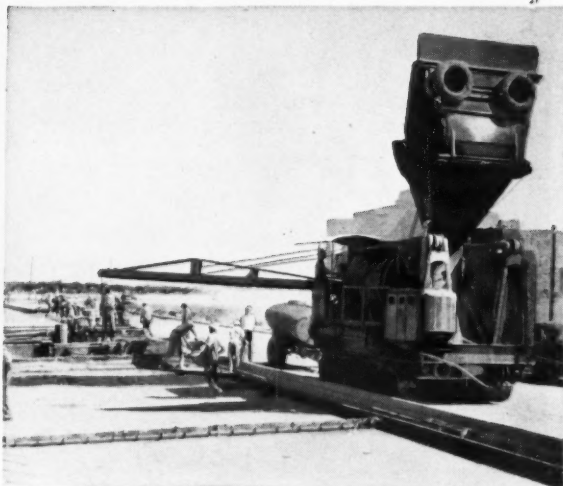






### WORKS 1/3 FASTER—CUT FUEL COSTS 60%

Maryland contractor Charles F. Knox, Jr., reports he gets 1/3 more production, has cut fuel costs 60%, since he converted this 3/4-yard shovel from *gasoline to GM Diesel power*. The shovel works 8 to 10 hours a day, costs far less to maintain. You can specify GM Diesel power in over 50 shovel models built by more than 20 manufacturers.



### PAVES 1400 FEET A DAY

This Koehring Paver, powered by a compact, quick-accelerating GM 2-cycle Diesel, lays 1400 feet of 25-foot wide pavement per day for the Austin Road Company of Dallas, Texas. You can lay pavement faster and at less cost with GM Diesel power—available as original equipment in 8 paver models made by 4 different manufacturers.



### "FASTEST DITCHER IN THE AREA"

McGuire & Hester *specified* GM Diesel power in two new Buckeye Ditchers and a Lorain Crane, as well as repowering a Hough Payloader, after getting *more work at less cost* with GM Diesel power in their dragline. The master mechanic calls this GM Diesel-powered Buckeye Ditcher "fastest in the area."



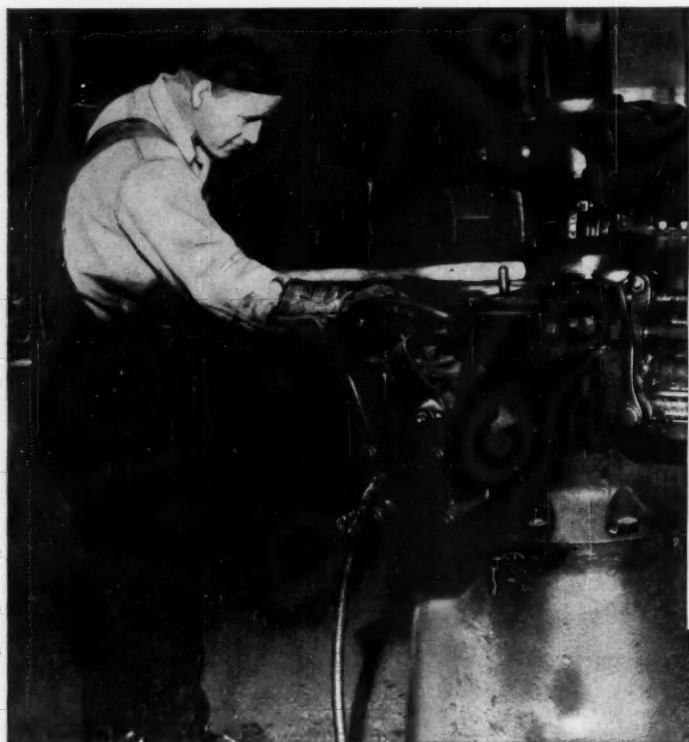
### NO REPAIRS IN TWO YEARS

These GM Diesel-powered LeTourneau-Westinghouse Tournapulls worked over two years in flying abrasive dust without losing a day for repairs, reports Arizona contractor Link L. Colvin. In every kind of earth-moving equipment GM Diesel power lasts longer, works faster, costs less to run and maintain.

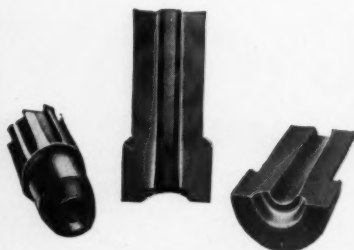
## DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS • DETROIT 28, MICHIGAN

Single Engines . . . 30 to 300 H.P. • Multiple Units . . . Up to 893 H.P.



**Nickel Alloyed Steel Dies** contribute to both efficiency and economy of Drill Steel Sharpeners like this Ingersoll-Rand Model 54... a type



**This Set of Dies**, for forming attachment ends, has remarkable toughness imparted by nickel. As a result, these dies can withstand heavy-duty service for long periods in the field.



**Drill Steel Showing Shank** formed by an I-R Drill Steel Sharpener. The attachment end, also forged by the machine, is shown after threading.

which often serves in remote parts of the world, where repair and replacement parts are sometimes difficult or impossible to obtain.

## How Ingersoll-Rand extends life of Drill Steel Sharpener dies

Operated by compressed air, I-R Drill Steel Sharpeners not only form shanks and attachment ends on Jackrods, but are also used to turn out a variety of other small forgings needed in the field.

Accordingly, you can appreciate why all dies, formers, dollies and the like... supplied for this work... must have ample stamina for repeated use on the job.

And for this repeated use, Ingersoll-Rand produces these vital parts in a die steel containing from 1½ to 2% nickel.

The addition of nickel imparts toughness, along with ample strength and hardness. This combination of properties in a

die enables the user to turn out uniform, accurate, true-to-shape forgings rapidly. For example, on one of the larger units, it is possible to forge as many as 50 shanks an hour.

This is one more example of the way nickel, either alone or in combination with other alloying elements, makes possible controlled improvement of specific properties. For the best set of properties to improve your products or equipment, look to alloys containing nickel. Send us details of your metal problem for our suggestions. Write us today.



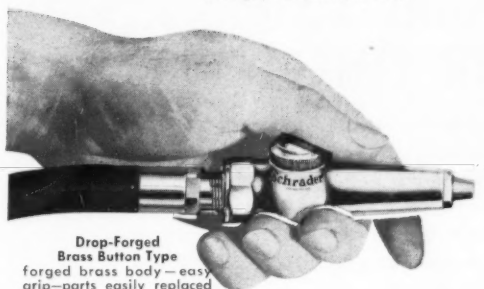
**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 WALL STREET  
NEW YORK 5, N. Y.



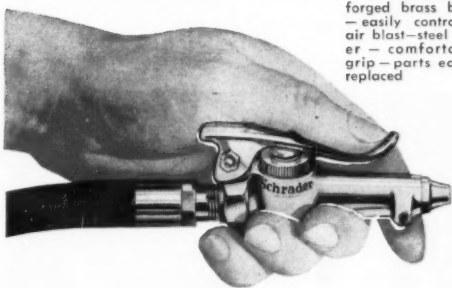
## Select Schrader Blow Guns

*They fit your hand  
They fit your job*

Drop-Forged Stainless Steel  
practically indestructible—simple  
construction—parts easily re-  
placed—protective hand guard  
and hang-up hook—comfort-  
able grip—countersunk nose



Drop-Forged  
Brass Button Type  
forged brass body—easy  
grip—parts easily replaced



Drop-Forged  
Brass Lever Type  
forged brass body—  
easily controlled  
air blast—steel lever—  
comfortable grip—parts easily  
replaced

A **Schrader Blow Gun** puts air where you want it . . . when you want it . . . and *just the way* you want it to do the job best. Choose from thirty-six designs and styles. Schrader Blow Guns take years of the toughest treatment you can give them—and come back for more. Here's why . . .

**They're rugged** both in design and construction. Bodies are drop-forged of either brass or stainless steel.

**They're convenient**—can be used anywhere. Blow gun circuits—using Schrader Couplers, Hose and Automatic Hose Reels—take little space, yet put compressed air right at your fingertips.

**They're economical**—they have few moving parts. And replacement parts, when and if needed, are easily installed.

**They're versatile**—with nine interchangeable noses—both fixed and adjustable—that fit all three standard-type guns, you can't think of a blow-gun application that Schrader can't meet.

It's easy to find out for yourself what a wide selection of blow guns is in the *complete Schrader Line* of air control equipment. Write today—or, if you prefer, fill out the coupon below.

### ADJUSTABLE NOSES



### NON-ADJUSTABLE NOSES



# Schrader®

LEADERS IN AIR CONTROL SINCE 1844

A. Schrader's Son  
Division of Scovill Manufacturing Company, Incorporated  
478 Vanderbilt Avenue, Brooklyn 38, N. Y., Dept. W-6

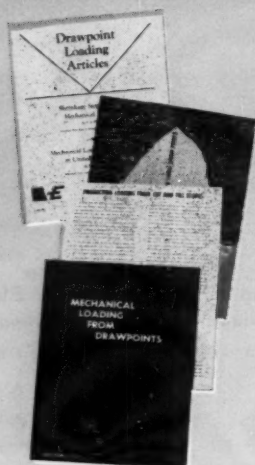
I am interested in more information on \_\_\_\_\_

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_



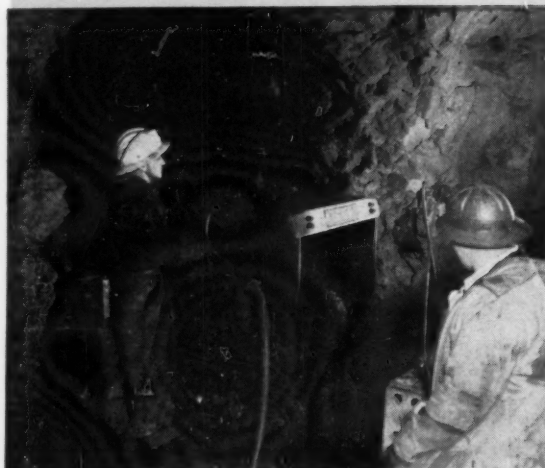


## DRAWPOINT LOADING WITH EIMCOS

Drawpoints can, with few exceptions, be used in any mining system. This economical production method is gaining in popularity and has numerous advantages in lower costs, higher production and greater safety.

Eimco has been able to reprint some of the numerous articles from mining journals and has gathered much original material. This information is now available in printed form.

Write for the L-1017 series of publications for information on Eimcos in drawpoint loading.



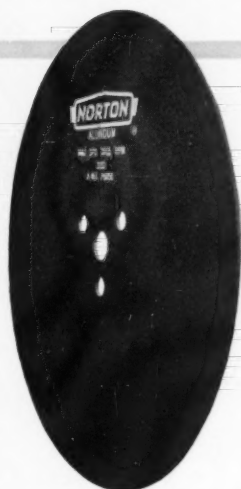
**THE EIMCO CORPORATION**

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

# Users tell you how These two cut-off wheels top all others

*Reports prove Norton rubber bonded R50 and resinoid bonded B9 wheels  
save on the widest range of wet and dry applications*



## For wet cutting Users' reports on how the Norton R50 adds the profit-boosting "TOUCH of GOLD"

- **Wheel life tripled** — Massachusetts tool manufacturer says R50 wheel, cutting-off high speed steel tap stock, lasted three times as long as best competitive wheel. Job required very smooth cut, with no burr or burn.
- **Best in every way** — Illinois maker of combination doors and windows reports R50 wheel produced

*The Norton R50* rubber bonded cut-off wheel is designed especially for wet cutting of ferrous bar stock up to 6" diameter. It is the wheel to use where quality of cut, without burning, is important. Built-in chip clearance — unusual in this type of wheel — is one of many "Touch of Gold" advantages for better cutting performance and longer wheel life.

best quality cut, fastest cutting action, longest life for cutting extruded aluminum frames.

- **Longer lasting, superior cutting** — Rhode Island oil seal manufacturer reports R50 wheel, cutting-off stainless steel, gave considerably longer life with better quality cut than any other wheel.
- **70% more durable** — New York steel company says R50 wheel beat durability records of two best previous cutting-off wheels by 70%. Work was on high speed and carbon tool steels.
- **First among four** — Pennsylvania manufacturer of coal mine bits reports R50 best wheel used for cutting alloy steel bit stock. Far superior, in quality of cut and durability, to three other wheels tried.

## For dry cutting Users' reports on how the Norton B9 adds the profit-boosting "TOUCH of GOLD"

- **100% more cuts** — New Jersey foundry switched to B9 wheels for cutting "Christmas tree" risers from precision castings, after tests in which B9 gave twice as many cuts.
- **Five times better** — California naval shipyard re-orders B9 wheel for aluminum cutting jobs. Reason: B9's 5 to 1 superiority over best previous wheel

*The Norton B9* resinoid bonded cut-off wheel is recommended for high production dry cutting jobs, especially where fast rate of cut is essential. It is made with either smooth sides or the rough "F" sides for more clearance in the cut. It will give you long, economical "Touch of Gold" performance in the widest range of ferrous and non-ferrous applications.

- **Best general purpose wheel** — Massachusetts manufacturer of molded rubber products reports the B9 best all-around cut-off wheel in their experience. Chief jobs were cutting various types of steel up to 3" diameter.
- **Unbeatable on Inconel** — Pennsylvania bearings company says it found no other wheels to compare with the B9 for cutting Inconel bar stock. Outperformed competitive wheels on all counts
- **565 more cuts** — Massachusetts manufacturer of textile equipment reports B9 wheel produced 700 cuts on 1 x 1/2 x 1/4" steel channels. This topped previous wheel's record of 135 cuts by 565 — for five times longer wheel life.



### Is wet or dry cutting best for YOU? — Ask your Norton distributor

If your cut-off wheels are performing poorly, or wearing out too rapidly, perhaps you ought to check your methods as well as your wheels. You may, for example, be dry cutting, when wet cutting would be more efficient — or vice versa.

Your Norton Distributor's abrasive specialist or your Norton Abrasive Engineer is always ready to give you plenty of, practical information on cut-off

methods — information that can save you money every day.

See your Distributor soon, or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal

cities, listed under "Grinding Wheels" in your phone directory yellow pages. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Making better products...  
to make your products better*

W-1602



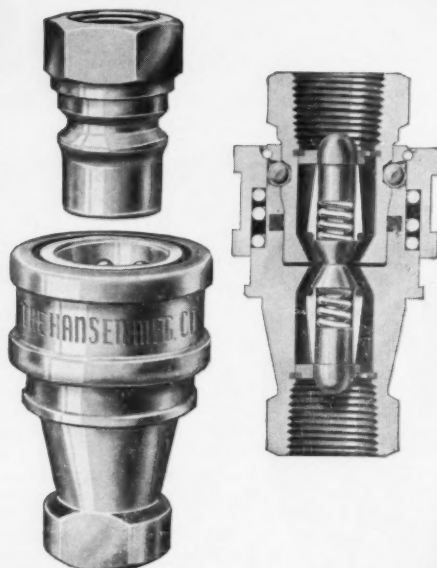
**and its BEHR-MANNING division**

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories  
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

# HANSEN

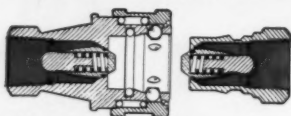
## QUICK-CONNECTIVE

# 2-WAY SHUT-OFF COUPLINGS!



**QUICK CONNECTION  
AND  
DISCONNECTION**

**INSTANT  
AUTOMATIC FLOW  
OR SHUT-OFF**



**Seals Both Ends of Line  
AUTOMATICALLY  
INSTANTANEOUSLY**

**Quick Connective  
Fluid Line Couplings for**  
AIR • OIL • GREASE • HYDRAULIC  
FLUIDS • REFRIGERANTS • STEAM  
VACUUM • OXYGEN • ACETYLENE  
GASOLINE • COOLANTS • WATER

HOSE CLAMPS • HOSE CLAMP  
PLUGS • HOSE CLAMP SOCKETS  
HOSE CLAMP COUPLINGS • AIR  
LIQUID SPRAY GUNS • AIR BLOW  
GUNS • SAND BLAST CLEANERS  
ENGINE CLEANERS

### **FEMALE PIPE THREAD CONNECTIONS FROM 1/8" TO 1"**

Hansen Series HK Two-Way Shut-Off Couplings are available with female pipe thread connections from 1/8" to 1" inclusive. Available in brass or steel.

*Also Straight-Through and One-Way  
Shut-Off Couplings. Write for Catalog.*

REPRESENTATIVES IN PRINCIPAL CITIES

SINCE 1915



**QUICK-CONNECTIVE FLUID LINE COUPLINGS**

## THE HANSEN

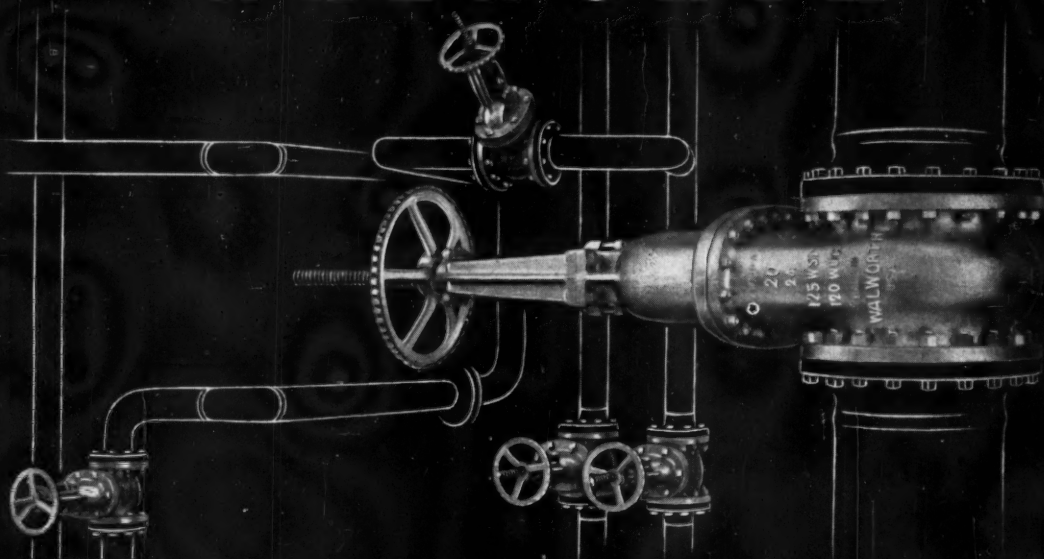
## MANUFACTURING COMPANY

4031 WEST 150th STREET

CLEVELAND 11, OHIO



# WALWORTH

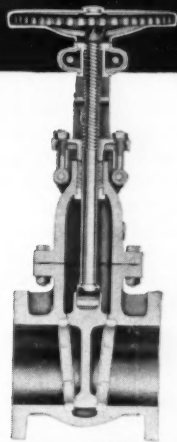


## IRON BODY WEDGE GATE VALVES

*Better because* ...The entire valve, from hand-wheel to seat rings, is ruggedly constructed to withstand rough and frequent usage. Body, bonnet, and yoke are sturdy castings with large radius fillets. Dimensions and drilling of end flanges are in agreement with American Cast Iron Flange Standards. Stiffening ribs connect end flanges with the body neck to maintain a rigid connection with piping.

A wide range of Walworth Iron Body Wedge Gate Valves is available—through your Walworth Distributor—from which you can choose the right type to meet your most exacting conditions. Saddle-type valves as small as 1/4-inch; low pressure valves for water and gas pipelines up to 36 inches.

Whenever you need valves and fittings, choose from complete lines—in a variety of metals—manufactured by Walworth. For more information, see your Walworth Distributor or write: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Walworth No. 726F OS&Y (Outside Screw and Yoke) Iron Body Wedge Gate Valve. OS&Y valves are recommended for services where it is desirable that the line fluid does not come in contact with the stem threads. Note the swing-type gland-eye-bolts for easy repacking. Sizes 2 to 30 inches.

# WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

**COULD YOU LEARN TO CARE  
ABOUT...**

# power factor?



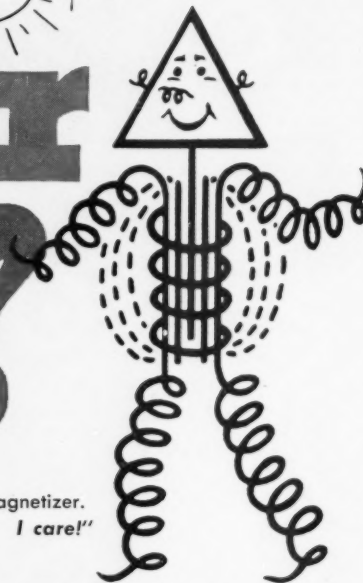
"Mortimer Magnetizer is my name. Nobody has ever actually seen me, but anywhere electric motors are being used I get a powerful lot of work done!

"What I do is really simple—I set up the magnetic fields in the motors, and until I get going nothing much happens in your plant.

"Now, that's all well and good. I like my work. But it's the *Power Factor* business that bothers me. Because of *low power factor* in many plants, I get a lot of blame that's really not my fault. Honestly.

"You see, many plants use a goodly number of induction motors, and I like to magnetize them . . . they're hard workers. But unfortunately the reactive kva which I must have to magnetize is not produced by an induction motor. Instead, I must draw it from the main power system, and in a plant full of induction motors I can really 'overdraw' my account!

"This means the incoming power system must carry *two* things—*kilowatts* for useful work by the motors, and plenty of *reactive kva* for my magnetizing. The more of the latter, the less of the former, and brother, that's *low power factor*. It's expensive, because the 'dead-head' reactive kva can't do the work you want done, and yet you pay for it.



"I'm Mortimer Magnetizer.  
I care!"

"What's the answer? Why, it's simple. The answer is Synchronous Motors. Use them wherever possible! They not only supply their own reactive kva for my magnetizing, but they can even be designed to supply extra or 'leading' reactive kva to offset kva demands elsewhere on the line.

"Now here's Utopia for me! When you use Synchronous Motors to supply reactive kva, you can reach a glorious state called **UNITY**, in which no costly reactive kva is required from the power system. Brother, that's *high power factor*, and that's how I work best!

"Where to go for Synchronous Motors and expert help on their applications? Go to E-M, of course. E-M pioneered the use of Synchronous Motors . . . E-M engineers know them and their applications from A to Z. And, naturally, Power Factor Improvement is a specialty at E-M.

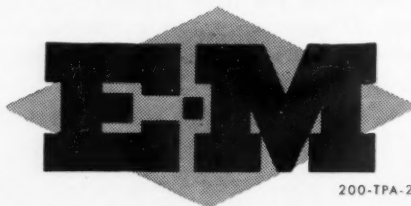
"Ask any E-M sales engineer near you. He's got facts, data, and helpful suggestions. He knows me, I know him. We work well together!"



## THIS New book WILL HELP YOU

"I've just looked over this new special issue of the E-M Synchronizer. It's called 'The ABC of Synchronous Motors' and it's exactly what you need to know to begin improvement of your plant power factor. Save some money . . . improve your efficiency of operation . . . write us on your letterhead, for a copy of 'The ABC of Synchronous Motors' today!"

**ELECTRIC MACHINERY MFG. COMPANY**  
MINNEAPOLIS 13, MINNESOTA



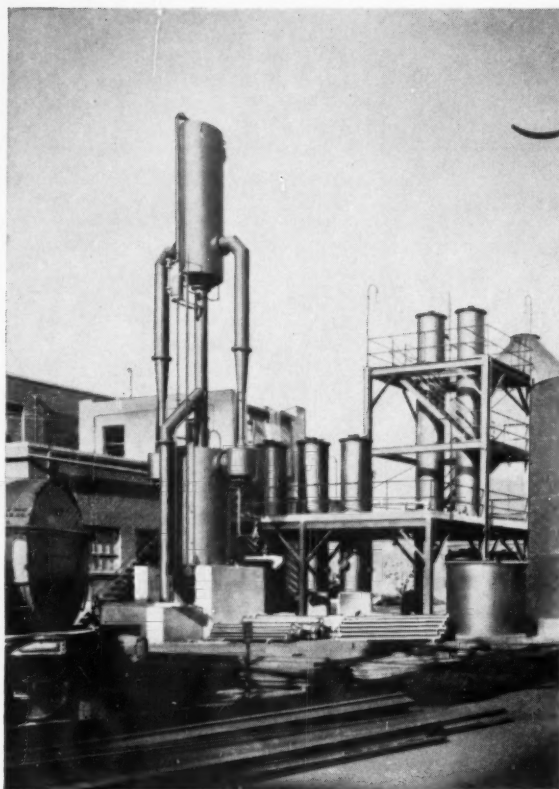
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**Specialists in making motors do EXACTLY WHAT YOU WANT THEM TO**

I-R Steam-Jet Refrigeration provides 100 gpm of

# CHILLED WATER

*for low-cost production of*  
**Chlorine Dioxide**



Here at the P. H. Glatfelter Company in Spring Grove, Pa., chlorine dioxide for bleaching wood pulp is produced at low cost by a Solvay generating plant. The process requires an abundant supply of *chilled water* for absorbing the unstable gas safely and in the desired quantity.

The Ingersoll-Rand steam-jet installation shown above provides 187½ tons of refrigeration, cooling 100 gpm from 90° to 45°F. The 2-stage unit with two boosters provides for maximum economy at part load operation. An I-R Class CRV pump handles the chilled water from the evaporator.

The safety, simplicity, dependability and economy of I-R steam-jet refrigeration make it the ideal equipment for use where steam is available and temperatures down to 35°F are required. For complete data on any application, call your Ingersoll-Rand representative or branch office.

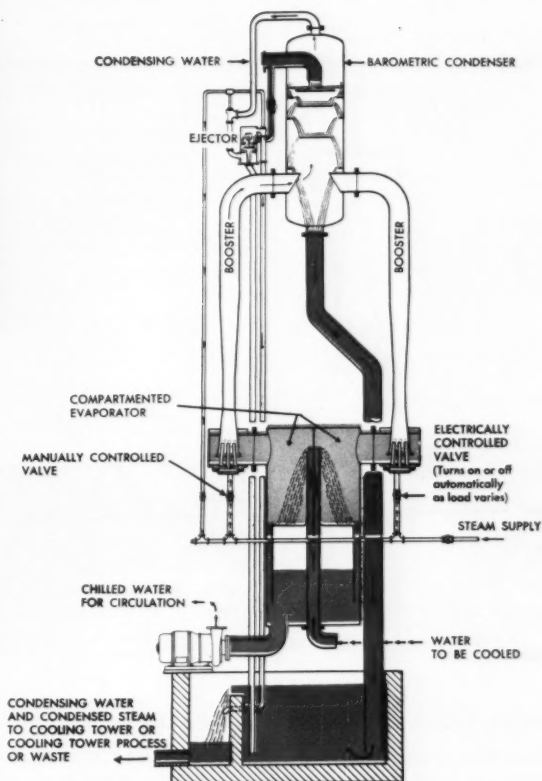


Diagram of I-R steam-jet cooler with barometric condenser and two boosters.



## Ingersoll-Rand

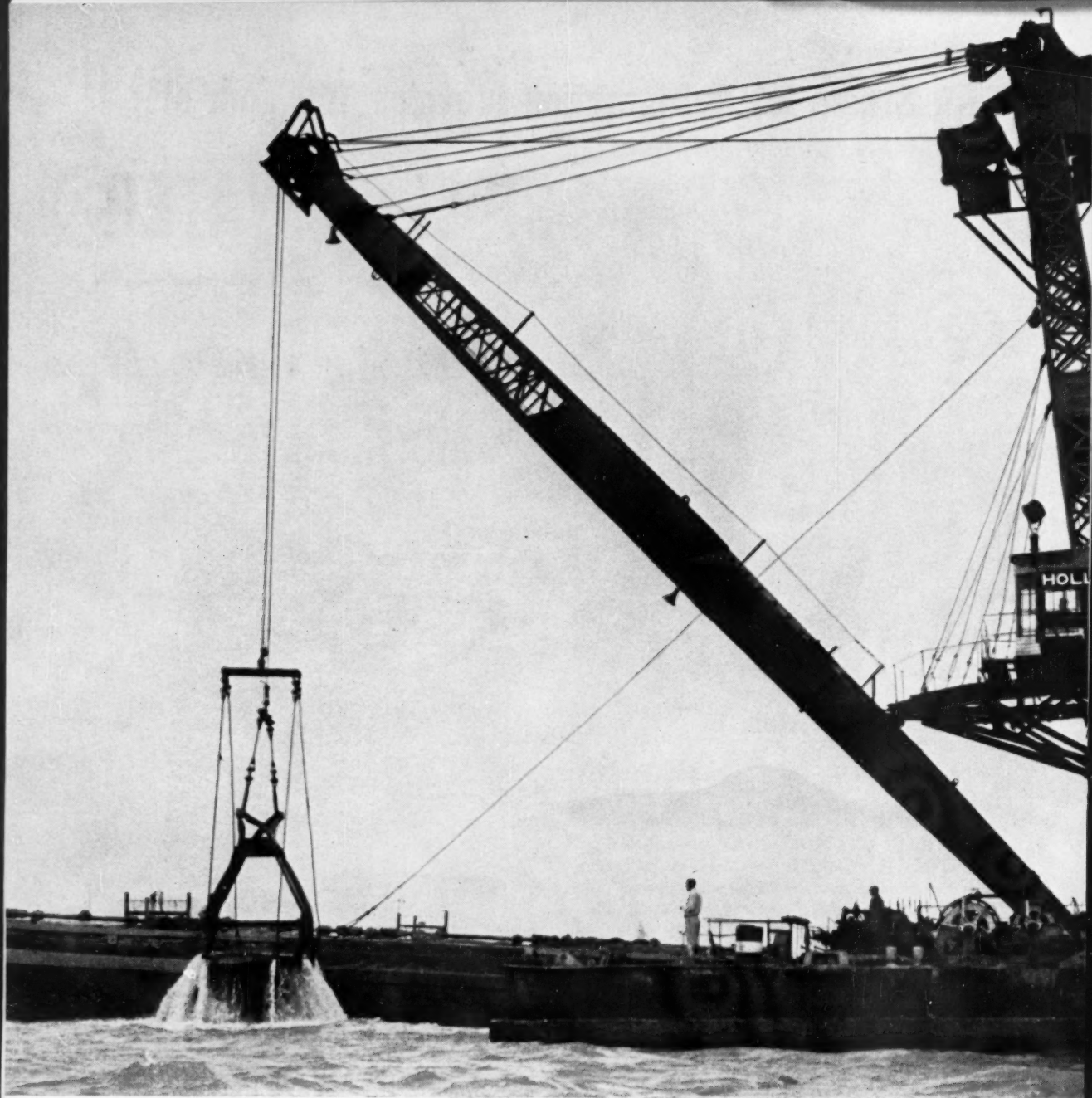
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PUMPS • VACUUM EQUIPMENT • COMPRESSORS • AIR & ELECTRIC TOOLS • TURBO-BLOWERS • GAS & DIESEL ENGINES

FEBRUARY, 1955

Circle 15A on reply card

4-108  
ADV. 17  
Circle 16A on reply card ➔



**Wire Rope at Work**—The *Holland*, a powerful unit owned by the Olympian Dredging Company, is shown here with a bite of San Francisco Bay in its clamshell bucket. The vessel was photographed while dredging for the 63 footings of the Richmond-San Rafael Bridge.

The *Holland* needs substantial quantities of strong wire rope for hoist, swing, anchor, handling, and spud lines. To fill these assignments, Bethlehem rope was chosen . . . several thousand feet in sizes ranging from  $\frac{3}{4}$  to 1  $\frac{1}{4}$  in. The grade was Purple Strand (improved plow), as loads were heavy and stresses high. As always, the Purple Strand rope had plenty in reserve for the tough daily grind, which often meant dredging to depths of 65 ft or more.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

CONSTRUCTION • MINING • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING





## ON THE COVER

THE buildings pictured on the cover house the head offices of some of the world's foremost industrial and mercantile organizations. Between them are the shaded canyons of the financial district. By day the section teems with humanity and hums with activity; at night it is practically deserted. The physical pattern of New York, with its numerous wide, deep waterways, is largely responsible for the city's unparalleled size and affluence. The tugboat in the foreground typifies the ceaseless movement of waterborne commerce.

## IN THIS ISSUE

AS OUR first article states, soda pop is now being canned and big things are expected of the new trend mainly because of what has happened in the case of canned beer. The first beer in cans appeared just twenty years ago, and skeptics predicted that consumers wouldn't like it, but the figures prove otherwise. Through 1954 a total of 42 billion cans of beer and ale were produced and, according to the American Can Company, the average family in the United States now consumes 160 cans of those beverages yearly. Soft-drink canners are hopeful, of course, that junior American pop imbibers will compile similar records.

MANY American cities get their water from rivers, but few of them tap the streams from underneath by way of a mile plus-long tunnel such as the Town of Tonawanda, N. Y., has just driven. The Tonawanda gallery is unusual on another score. Using flexible, lightweight drilling equipment, handled by experienced crews under expert supervision, the contractor set some new records for speed of progress. Page 38.

CREOLE Petroleum Corporation is operating the largest plant yet built for the purpose of reinjecting natural gas into an oil field to maintain pressure in the underground producing formation. Perched on a concrete platform 7 miles offshore in Lake Maracaibo, Venezuela, ten centrifugal compressors, arranged in series to form seven stages, are daily compressing 137 million cubic feet of gas, measured at atmospheric pressure, to 1935 psi pressure and sending it back into the ground through wells. This pressure is almost twice as great as any previously obtained with equipment of this type. Each compressor is driven by a 6000-hp gas turbine, and the ten machines constitute the greatest existing concentration of this comparatively new kind of prime mover. Page 43.

# Compressed Air Magazine

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# Now They're Canning Soda Pop

General Beverages, an Early-bird Concern in the New Field, Is Capitalizing on the Donald Duck Trademark

**Porter V. Taylor**

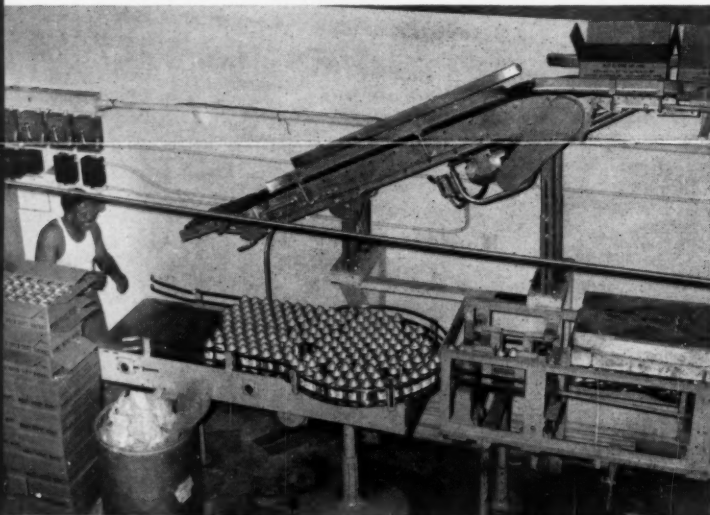


## SALES PROMOTION EFFORTS

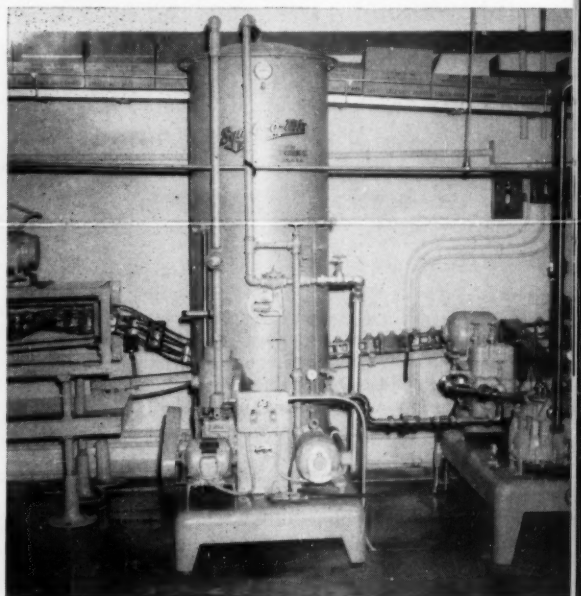
To push its product, General Beverages uses billboard and newspaper advertising and store displays that feature pretty girls. Introductory sales at a Miami supermarket

were boosted by giving kids a free ride on a truck-mounted merry-go-round for each can top presented. The drinks sell for ten cents a can; slightly less in cases of six or more.

## Sequence of Canning Operations



**1 CAN UNSCRAMBLER.** Empty Crown cans in cartons at left are dumped on a moving table top where a circular "unscrambler" feeds them into the line at the right. The first operation is a thorough rinsing. Empty cartons ascend and travel by an overhead conveyor to the end of the processing line to be packed with filled cans.



**2 MIXING STATION.** The equipment shown, although vital to the canning process, is by-passed by the can line seen in the back. In the large central vessel air is removed from filtered water by the application of vacuum. At the right, water and flavoring syrup are combined in correct proportions to produce the beverage.

**W**HEN the idea of marketing soft drinks in cans was first advanced, the trade papers of the industry hooted with derision and predicted an early end of what they termed a passing fancy or a flash in the pan. Most of the major bottling companies refused to give serious thought to the innovation and stubbornly ignored its possibilities even after the first venture, by Cantrell & Cochrane, of Long Island City, N. Y., had achieved national distribution of the product.

But while others criticized, one soft-drink man, who held a different opinion, was busy planning a chain of canneries that will soon be ready to serve most of the country. He is Jack Harkins, president of General Beverages, of Chattanooga, Tenn., who has predicted that the new development will change the drinking habits of America.

After making a fortune with Pepsi-Cola, Mr. Harkins joined General Beverages to market bottled carbonated drinks under the Donald Duck trademark, which will also be applied to products canned in subsidiary plants. The first of these canneries has been operating in Miami, Fla., since early last summer and others are either functioning or being constructed in South Bend, Ind., Monterey, Calif., and Chattanooga. At least four more will soon be underway in other parts of the United States.

Several foreign markets are being examined. Sales overseas, states Mr. Harkins, will be furthered by low-cost water transportation and the ready-made international popularity of the Donald

Duck name. This copyrighted trademark is already known far and wide through the movies, tinned fruit juices, frozen concentrates, numerous other foodstuffs, souvenir novelties and comic books (the sale of these books exceeds that of Life Magazine).

Before the pioneer plant was in operation, inquiries were pouring in from brokers and distributors of other Donald Duck lines who were interested in obtaining franchises for the canned drinks. The first exports will probably go to Cuba and other Latin-American countries. The Philippines and Hawaii also are scheduled to be served from west-coast establishments.

The Miami company—General Beverages of Florida—is headed by Harry

J. Krueger who formerly was president of a brewery in Peoria, Ill., and of the National Beer Wholesalers' Association. The plant occupies a new building having 15,000 square feet of floor space and cost approximately \$500,000, with about half of the sum going for canning machinery and the remainder for construction, office equipment, delivery trucks, etc. Some of the machinery is of the same type as that used by both the general bottling and canning industries, plus special equipment to meet the needs peculiar to the canning of soft drinks.

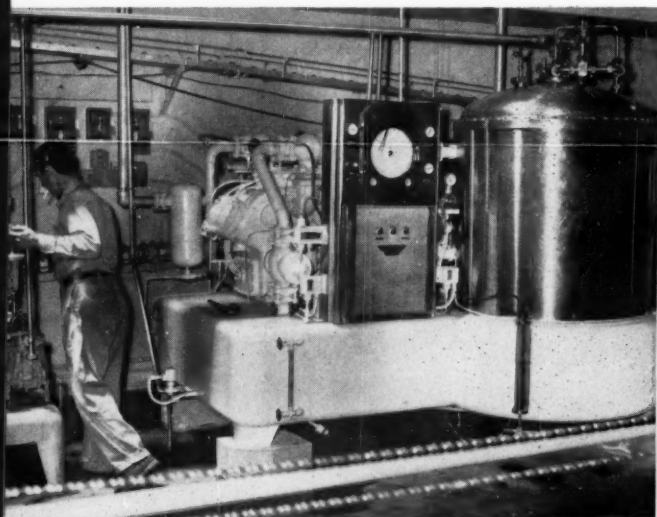
The first requirement in turning out a top-quality canned beverage is an ample supply of good water, and in this case it is obtained by treating Miami water in a filtration plant with a capacity of 1500 gallons per hour. It approaches distilled water in purity by the time it leaves the system. Flavoring syrups are prepared by mixing concentrates and water in one 1000-gallon and three 500-gallon tanks of stainless steel. Mounted inside of the containers, both top and bottom, are motor-driven blades which churn the fruit syrups, while the cola-flavored variety is aged for 48 hours with only an occasional stirring because a better product is obtained in that manner. From the tanks the liquids are piped to the "canning line."

Empty cans are received in cartons, which are all ready with the company's name and product information printed on them so they can be utilized for shipping the canned drinks. The tins are dumped on a revolving table known as an unscrambler, from which they go into

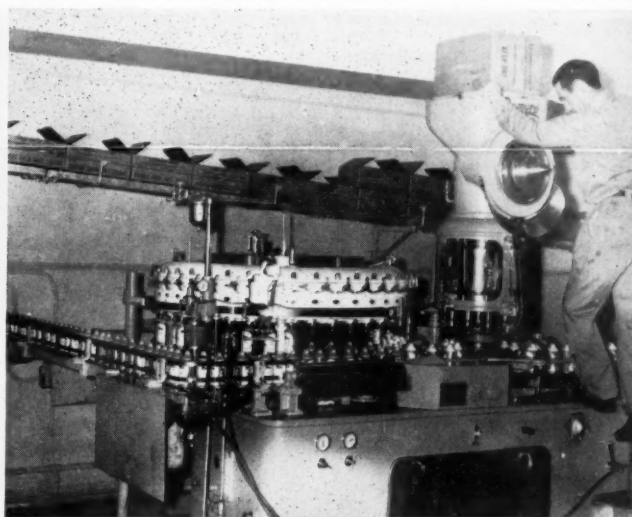
### Soft-Drink Cans

**A**T THE beginning of 1954 only five soft-drink canneries were operating in the United States, but by October there were 40 and the number was expected to reach 60 or 70 by the year's end. Barron's Magazine has estimated that they collectively put out a billion cans of beverages in 1954.

Leonard Green, president of the Doctor Pepper Company, predicts that eventually 35-40 percent of all packaged soft drinks will be canned. (Canned beer, introduced in the 1930's, now accounts for one-third of all packaged sales of the brew.) Government figures on shipments of cans in August showed 5584 short tons of steel consumed in the manufacture of soft-drink cans, as compared with 67,903 short tons for beer cans.

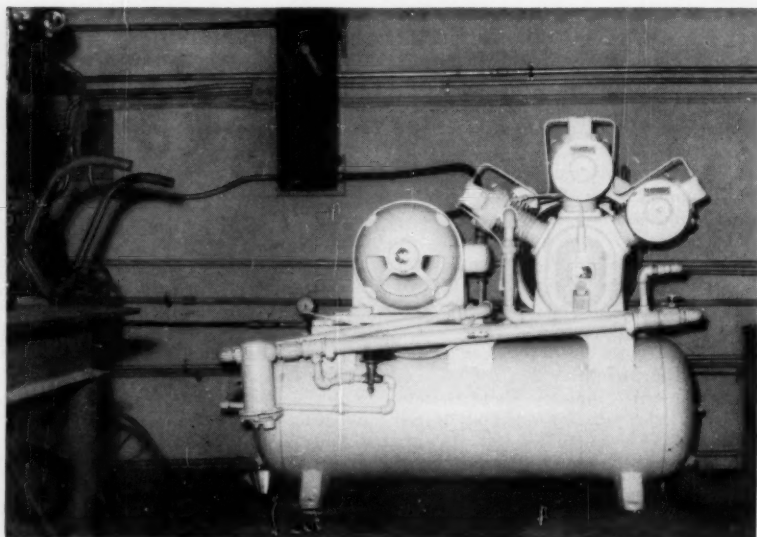


**3 CARBONATOR.** Known as a Carbo-Cooler, this machine both carbonates and cools the beverage. Chilling is necessary to allay foaming during subsequent operations. The unit behind the instrument panel is a compressor that serves to effect cooling. Here, again, the can line by-passes the equipment, as shown.



**4 FILLER AND CROWNER.** As the cans pass through the unit at the left they are filled with beverage 40 at a time from as many spouts. Moving on to the right, cork-sealed metal caps or crowns are applied to the containers as they travel around the cylindrical machine. The man is replenishing the supply of crowns in the hopper.





#### SOURCE OF AIR POWER

This Ingersoll-Rand 58-cfm air-cooled compressor supplies air at 60 psi pressure for drying filled cans after they come from a hot-water dip (picture at right below). Another I-R unit of similar type furnishes air for operating other equipment on the canning and packing lines.

an enclosed canning line in which they are held in varying positions as required to carry out all phases of the filling operation. In the meantime, the empty cases travel by overhead conveyor to a packing machine at the end of system, where they again meet the cans.

Upon entering the line, the tins receive a thorough rinsing and then pass to the filling machine. Meanwhile, water from

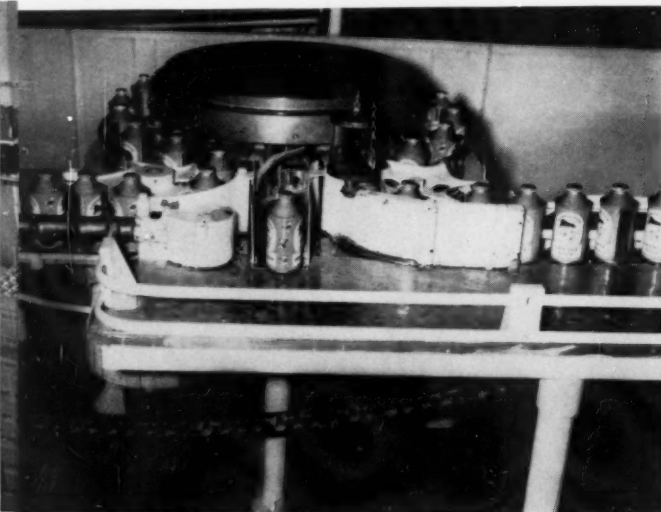
the filtration tanks is fed through a de-aerator where excess air is removed from it by the application of vacuum. The flavoring syrup is then combined with the water in a Syn-Cro-Mix Syncrometer which accurately proportions the two fluids and thoroughly mixes them.

Now the beverage, at prescribed strength, flows through a Carbo-Cooler which carbonates and chills it to a few

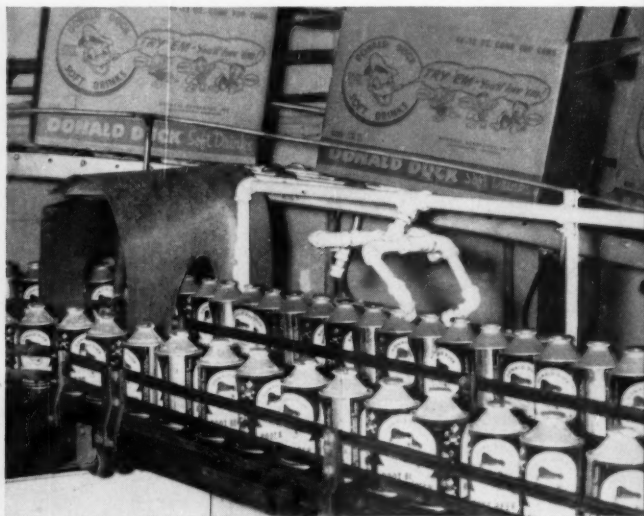
degrees above the freezing point so as to eliminate foaming during the remainder of the processing stage. From there the cold liquid goes to a 40-spout Du-More machine that both fills the cans and caps them. The pistons on the filler are operated by compressed air. Next, the cans are weighed by equipment that automatically rejects, by means of air power, any that have not been completely filled. This inspection can be carried out visually in bottling plants, but in the case of opaque containers some other system obviously had to be devised.

As the beverage comes off the line it is still very cold, and moisture immediately starts to condense on the outside of the tins. This sweating occasions no trouble with bottles that are placed in wooden crates; but when lithographed cans are packed in cardboard it not only ruins the cartons but also gives the cans a messy appearance. At this point compressed air again enters the picture.

So as to get the product back to room temperature in the shortest possible time, the cans are detoured through a tank of hot water. As they emerge from this bath, jets of air blow off surplus water and quickly dry them ready for packing into the cases. This is done by a machine that can be adjusted to handle lots of 24 or 48, depending on the size of the carton, and that is designed to raise and lower each case by air power. After leaving the packer, the containers travel through a unit that applies glue to the flaps and seals them. Finally, they are placed on pallets to be carried by lift trucks to the warehouse for tem-



**5 WEIGHING STATION.** This inanimate detective makes sure that purchasers get all they pay for. Here cans are weighed individually. Those that are short of the 12 ounces specified as the net contents are ejected from the line by an air-operated pusher device. A can that has failed to pass the weight test is shown in the center.



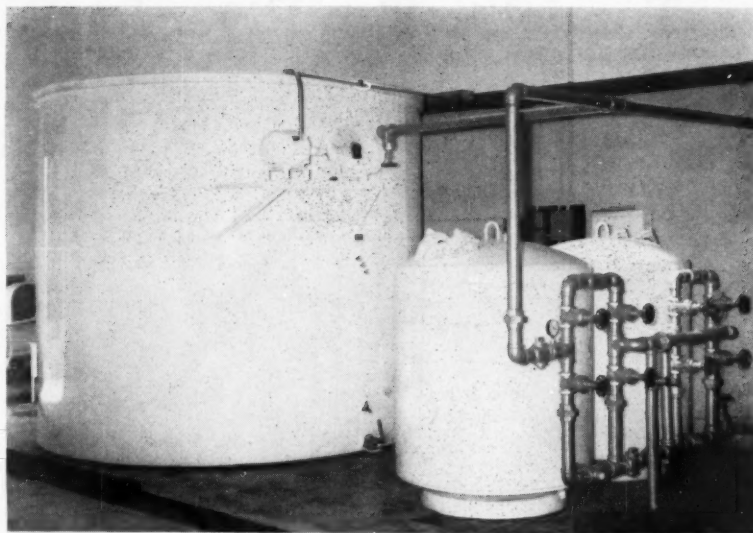
**6 PNEUMATIC TOWEL.** To prevent the "sweating" that would result if the still-cool cans were packed in cartons, they are run through a hot-water bath. Surplus water is blown off with air inside the hood, left, and air currents issuing from the white pipes dry the cans. Those in the foreground are en route to the hot bath.



porary storage or to be loaded either into boxcars at the rail siding or into waiting delivery trucks.

At present, the plant is producing five soft drinks: cola, root beer, orange, grape and strawberry. Lemon-lime and at least two other fruit flavors are to be added to the list. The cans are lithographed in different colors, one for each beverage, and on each container and cap are pictures of Donald Duck and the little ducks. The cans have a cone-shaped top and concave bottom to help withstand the pressure of the carbonated liquid. They are in rather short supply because of the rapid growth of the industry, but General Beverage took care of its foreseeable needs by making an advance arrangement with Crown Can Company. Although some concerns are using flat-top cans of one or two sizes, the Donald Duck brand comes only in cone tops of 12-ounce capacity.

In most retail stores the price is ten cents per can, with a slight reduction for half a dozen or more. Ounce for ounce, this is a little higher than that of bottled drinks in Miami and most other areas. But the company contends that canned beverages are preferable to bottled ones and is setting forth the advantages it claims for them in an extensive newspaper and billboard advertising campaign. A special point is made of the fact that customers do not have to pay a deposit to insure the return of the containers. This feature pleases both consumer and retailer, for it relieves the latter of the chore of handling empty bottles. Housewives are informed that



#### GOOD WATER IS VITAL

The most essential ingredient, pure water, is obtained by putting the product of the city taps through this filtration and purification equipment which has a capacity of 1500 gallons per hour. By the time it leaves the system it approaches distilled water in purity.

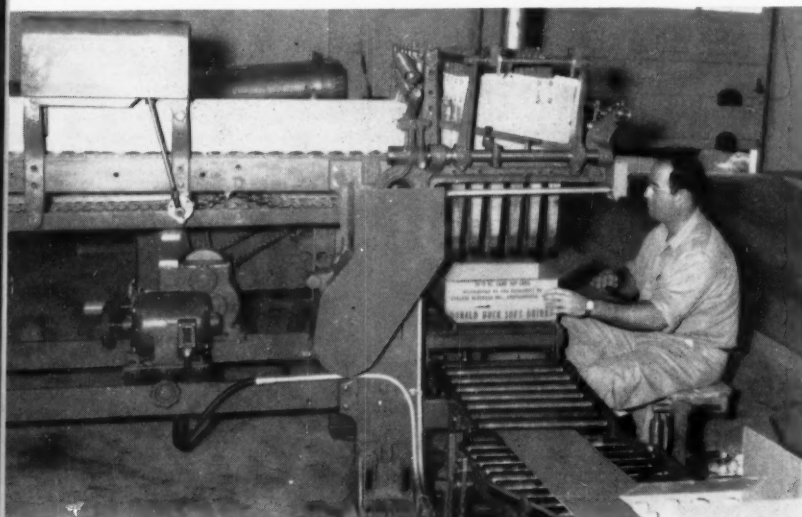
canned drinks take up less space in the refrigerator than bottled ones and get cold quicker. And the Donald Duck trademark and displays appeal to children, of course.

The company is pushing its cola flavor as a variety of the late Dr. J. R. Pemberton's formula. Known as the father of the cola industry, he considered it to be an improvement on his original Coca-

Cola recipe and General Beverages is said to have paid his estate more than \$500,000 for it. The Miami plant has been operating at its full daily capacity of 48,000 cases of 48 cans each. Some of the major soft-drink bottlers, including several that originally thought the public wouldn't take to canned soft drinks, are reported to be planning canneries. Champions of the idea are now recalling that beer in tins was also greeted with much skepticism at the time it was introduced.

#### FAMILIAR FACE

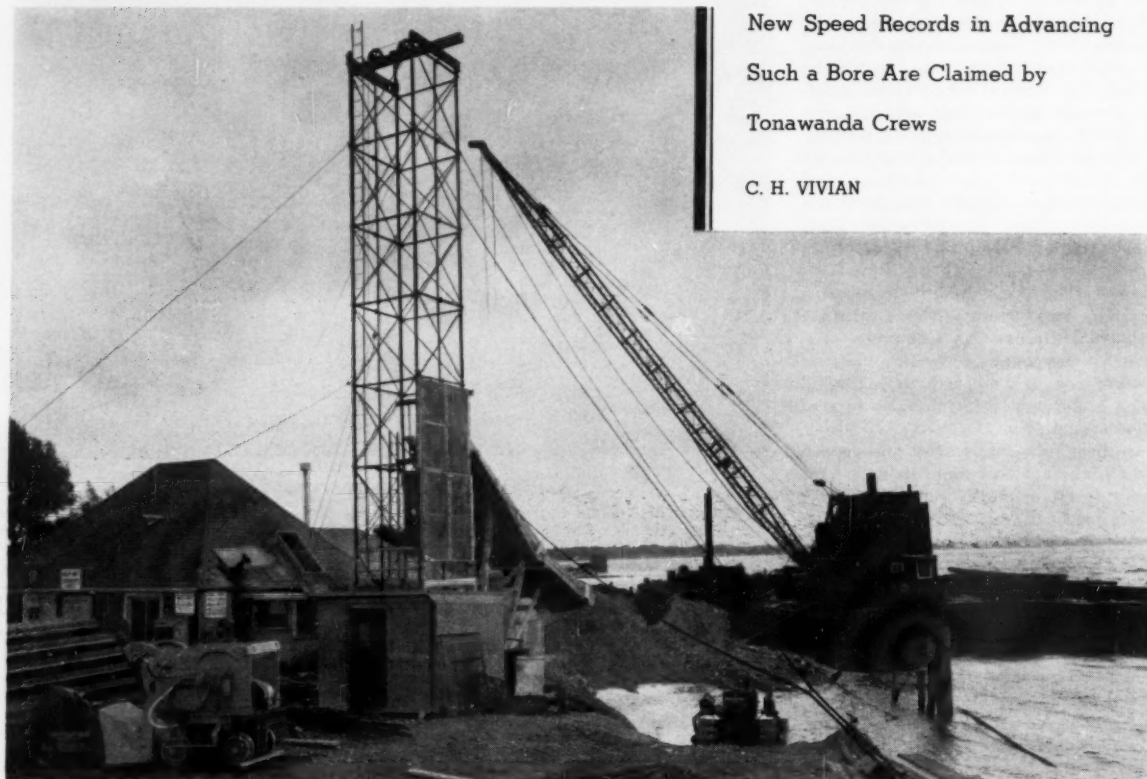
The use of Walt Disney's popular cartoon character as the trademark insures widespread interest in the beverages among children. The cone-topped can has a concave bottom to help withstand the pressure of the carbonated drink.



**7 PACKING.** When they reach this point the cans are dry and their contents are at room temperature. Here they are put in cartons holding either 24 or 48 cans. The platform, right, on which the cases stand is raised and lowered by an air piston. The conveyor in the foreground takes filled cartons to a gluing and closing machine.



# Tunnel to Tap River for Water Supply



New Speed Records in Advancing  
Such a Bore Are Claimed by  
Tonawanda Crews

C. H. VIVIAN

## HEADFRAME AND HOIST HOUSE

The only access to the tunnel is through a 10-foot-diameter circular shaft 110 feet deep at the edge of the river. All muck came up the shaft and was dumped and spread to

fill in a low area. The barge at the right was placing steel sheet piling along the waterfront to retain the spoil. The hoist and compressor house is at the left.

**T**HE TOWN of Tonawanda, N. Y., is solving a long-existing need for more water by tunneling under and tapping the adjacent Niagara River. By next November it will have in operation approximately \$7,000,000 worth of new facilities that should meet requirements for a good many years to come.

The Town of Tonawanda lies immediately north of the city limit of Buffalo. The word "town" here has the meaning usually associated with "township"; that is to say, it designates a unit of administration in a rural or suburban section. A little farther north are the municipalities of Tonawanda and North Tonawanda, but they are, strangely enough, not within the Town confines. The Town lies between Buffalo and the two cities just mentioned and is actually a Buffalo suburban area. As the accompanying place map shows, its western border is the Niagara River or, more precisely, the east branch of the river, for the stream divides just north of Buffalo and flows around Grand Island for several miles.

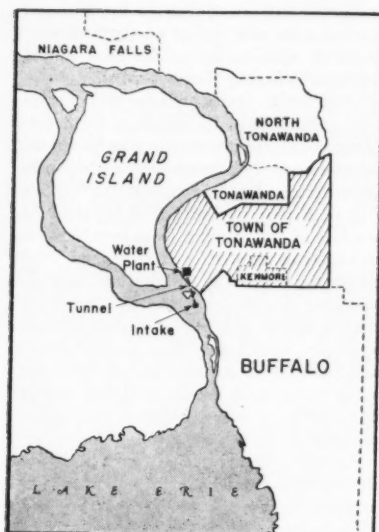
Having an extent of approximately 20 square miles, the Town is both a residential and industrial section. The industries include steel plants, metalworking establishments, oil refineries and miscellaneous manufacturing plants. The village of Kenmore is the only incorporated municipality in the Town and lies at the southern edge, adjacent to Buffalo. The Town's water plight has resulted primarily from its rapid growth. At the time of the 1950 census it had a population of around 50,000; now it is unofficially estimated at 70,000. It is still increasing rapidly, and new homes are going up at the rate of 1500 to 1600 a year.

The Town of Tonawanda is in Erie County and is getting its water from the Erie County Water Authority, which took over the service facilities of the Western New York Water Company about two years ago. The water comes from Lake Erie at a point near Woodlawn on the south or far side of Buffalo. As the Authority supplies water to the suburban area of Erie County adjacent to Buffalo it has been unable to keep up

with the mounting requirements. The Town has been receiving on an average 7,000,000 gallons per day, but has a peak summer demand of about 16,000,000 gallons.

Plans for measures to augment the supply have been under discussion for a decade or more, and in recent years the Town engaged the Buffalo engineering firm of Nussbaumer, Clarke & Velzy to study the situation and recommend a course of action. The current construction program is the result. Its key feature, and the one of major interest right now, is the 5800-foot-long tunnel that is designed to place the water intake almost at midpoint of the river just short of the international boundary with Canada.

By usual standards, sanitary engineers say, Niagara River water can be called "good," but in that highly industrialized section some wastes inevitably get into the stream. However, they cling pretty close to the shore where they enter and have little effect on the purity of the water farther out where the water intake



#### LOCATION MAP

The Town of Tonawanda lies just north of Buffalo and is a distinct geographical and political division not to be confused with the municipalities of similar name just north of it.

is located. The supply withdrawn will, of course, be given the conventional treatment to remove any possible contaminants from upstream disposal-plant discharges and industrial wastes.

The tunnel starts from the bottom of a shaft at a point approximately 100 feet below water level at low datum. Al-

though the Niagara is merely the connecting link between lakes Erie and Ontario and is less than 50 miles long, its surface elevation fluctuates surprisingly—as much as 10 feet. The cause is not so much a variation in the inflow to the “upstream” lakes of Superior, Michigan, Huron and Erie as it is the influence of barometric pressure and winds. When there is a high-pressure area at one end of Lake Erie and a low one at the other end, the body of water is in effect “tilted” to a minor degree. Proceeding out from shore, the bore rises on a slight grade and its terminus is around 70 feet beneath water level.

The tunnel line does not go straight out from the river bank but angles sharply upstream. This locates the intake at the place selected by the engineers—near the center of the stream and in a good depth of water. The intake will be approximately 12 feet below mean low water where it will escape the influence of ice in the winter and of moss in the summer. Actually, a considerably shorter bore could have been driven if a starting point directly opposite the same intake site could have been obtained, but that was not possible because of the unbroken industrial holdings along that stretch of waterfront.

Tunneling was selected over an alternate proposal of laying a 60-inch pipe in an excavated trench in the river bottom. Trenching would have required the use of costly floating equipment, and the task of maintaining a uniform grade would have been complicated by the un-

evenness of the river bed; in fact in one short stretch, where the line crosses a spur of Strawberry Island, earth and rock removal would have been particularly heavy. Contractors were permitted to bid on either type of construction, and their response showed clearly that a tunnel would be the least expensive. The low and successful bid of around \$1,200,000 was presented by Herbert F. Darling, a prominent Buffalo contractor.

Tunnel driving has been noteworthy for several reasons. For one thing, record advances for a day and for a 5-day week in this type of bore were established. In the second place, drilling was done well-nigh entirely with three light rock drills. A third outstanding feature was the perfect safety record. This was not unexpected, however, in view of the fact that the Darling firm has received two Associated General Contractors national safety awards covering two 5-year periods.

The bore is of horseshoe shape and was excavated to a nominal diameter of 7 feet 10 inches, which was calculated to give it a finished diameter of 7 feet inside a concrete lining of 5-inch minimum thickness. It was driven through sedimentary strata, which lie almost horizontal. The predominating rock is limestone, which occurs in beds ranging from a few inches to 2 or 3 feet thick. Gypsum exists in lesser amounts, and beds of either of these main rocks are commonly separated by thin layers of shaly material. The prescribed slope of 6 inches in every 100 feet was moderated somewhat during the latter stages of tunneling by permission of the engineers to enable the crews to follow a favorable horizon in the bedded rock.

The access shaft of 10-foot circular cross section was started by driving sheet piling and then sinking with two drills mounted on a quarry bar which was, in turn, arranged to rotate on a circular track. As the drills could also be moved along the bar, this made an extremely flexible and maneuverable rig. The shaft reached its specified depth of approximately 110 feet early last year, and the tunnel heading was turned on February 23, 1954. For a time thereafter while operations were being organized only one shift was worked and the job got going in earnest with three shifts on April 8.

Drilling was done for the most part with two Ingersoll-Rand JR-38A Jackdrills with a third one of the same kind as a spare. Finally, when the speed of the round was accelerated by utilizing the reserve machine, a J-50 Jackhammer mounted on a short leg acted as a spare. The latter was occasionally used while one of the regular drills was being serviced, but the JR-38A's did essentially the entire job.

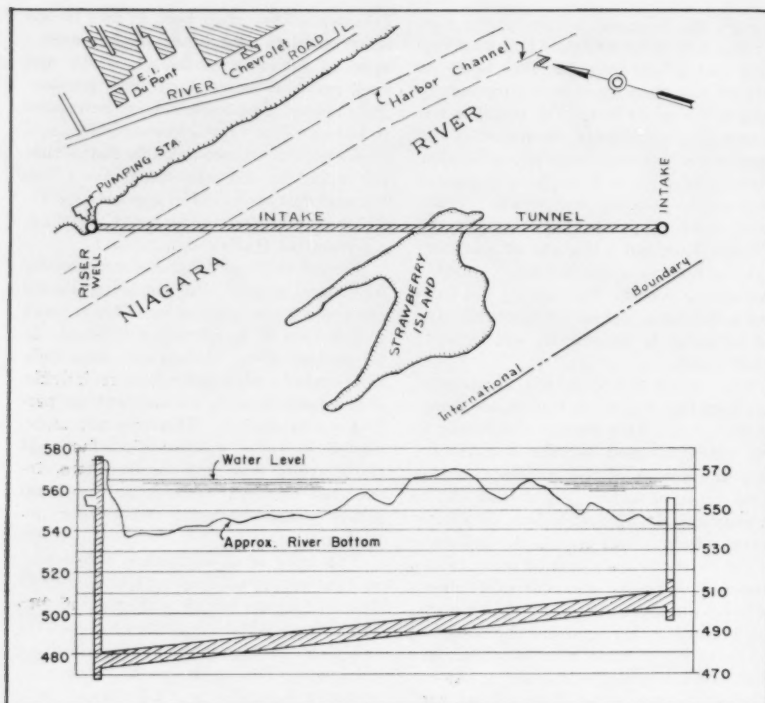
The JR-38A is an integrated rig consisting of an R-38 Stopehamer drill mounted on a slender supporting column



#### DRILLING SETUP

These three light, easily maneuverable Jackdrills put in substantially all of the more than 24,000 blastholes and in doing so set new records for advance. An air leg or cylinder supports each drill and supplies some of the pressure needed for efficient drilling. It has a “claw” at the lower end to grip the rock floor and hold it steady.





**TUNNEL PLAN AND PROFILE**

The bore angles upstream from the shore because land directly opposite the selected intake point was not available. The shaft that provides access for construction purposes will be used as a riser well when the system is in operation. The intake in the river will be about 12 feet beneath the surface at mean low water.

or leg which is, in effect, a telescoping air cylinder. The assembly is much like a conventional stopper with a hinged joint that permits turning it in any direction. The air leg bears the weight of the drill and the operator has only to hold it and apply a small amount of pressure to maintain a satisfactory rate of penetration. This type of support evolved from makeshift devices such as the "Finn board" and the "Mexican setup." In the case of the former, the machine was laid on a long tilted plank to steady it, and in the latter in a bend or crook at the top of a piece of old drill standing on end. In 1938, Ingersoll-Rand Company introduced an experimental unit consisting of a Jackhammer fed by an air cylinder, and air legs were soon in general production.

The 1-piece Jackdrill is an improvement on the earlier models. Its big advantage is that it provides a firm support for drilling without being rigid or fixed, thereby permitting changes in position and movement from one hole to another with the same facility as a hand-held drill. When once in position, however, it requires far less exertion by the operator.

The drilling pattern consisted of 25 holes, each 6 feet deep, plus one 15-foot pilot hole designed to test the formation ahead and especially to ascertain if there

was water to contend with. Sometimes the test hole also served as a blasthole. The 6-foot holes normally broke out a section of rock averaging only between 5½ and 6 feet. However, disregarding this shortage in figuring the total hole footage and also the fact that a new test hole was generally drilled the full 15 feet each round, it is apparent that the three drills drove 150,000 feet of hole, or an average of 50,000 feet each.

The actual drilling elements were Ingersoll-Rand steel Jackbits of conventional 4-point design and having a side hole to discharge air sent down through the hollow drill steel to blow out cuttings. The bits were normally reground once and produced around 60 feet of hole each before being discarded. With the Jackdrills it was unnecessary to change drill rods as a hole became deeper, and each hole was started and finished with the same 7-foot, 1-inch-diameter hexagonal steel.

Holes were loaded with Du Pont Gelex No. 2 powder of 38 percent strength in 1-inch cartridges, consumption averaging 55 pounds per round. Shots were fired electrically from a point 1000 feet back of the heading. The relatively short rounds and the drilling of closely spaced holes that could be loaded on the light side were all concessions to the rather thin cover of rock. Actually, the roof is

nowhere less than 35 feet thick and much more in some places, but no chances were taken of opening up cracks that might result in deluging the workings.

After each blast, smoke and fumes were exhausted from the face for a few minutes and then fresh air was blown in, the men usually being back on the job in ten minutes. For this ventilating service a 12-inch pipe line extended to within a few feet of the heading from two blowers arranged in tandem and equipped with valves for reversing the flow, as desired. Mucking was done with an Eimco No. 21 loader, which shoveled the rock into 1-yard steel end-dump cars each of which was transferred in turn to the rear of a train by use of a conventional siding maintained a short distance back from the face.

Strings of ten cars each were pulled to the shaft bottom by a Mancha storage-battery locomotive, and two trains sufficed to dispose of the spoil from a round. At the shaft the material was dumped from the cars into a skip and then hoisted and dumped through a chute to the ground, where it was spread by a bulldozer to fill in a low area behind steel sheet piling driven at the edge of the river. Considerable new ground was thus "made." The drilling-blasting and mucking cycles ordinarily required 1¼ hours each, or 2½ hours combined. Thus, roughly three rounds were generally completed each shift, but sometimes four.

The record performances came on the five working days starting with November 11. On the first day 46 linear feet was driven, and that is believed to be the greatest progress ever made in 24 hours



**PINNING UP ROOF**

This man is using a Size 51 Impactool to tighten the nut on one of the bolts holding a plate in place to help support the roof. The long bolts "tie" the exposed rock to that above it and eliminate the need of erecting timber or steel sets, as was formerly done on such jobs.



#### DRILLED FACE AND MUCKER

The tunnel breast, with 25 holes drilled and loaded for blasting, is pictured at the right. Wires connecting all holes are not visible, but the line to be used for firing the shot from 1000 feet back in the tunnel is seen angling upward at the right. The other view shows the scoop of an Eimco loader about to swing back to deposit its load in a car. Both pictures illustrate how fine the rock was broken by close spacing of the blastholes. Each round of drilling and blasting removed about 55 cubic feet of material.



in a tunnel advanced underwater from one heading with access through a shaft only. On the following day 35 feet was excavated, after which there was a 2-day idle period of Saturday and Sunday in accordance with the 5-day work schedule. On the next three days the heading was driven 36, 45 and 42 feet, respectively. The total progress of 204 feet in five days is likewise thought to be the highest ever registered on a tunnel such as this one. Every effort was made to check previous high marks before new records were claimed.

Contributing to these notable achievements were the efficiency and dependability of the drills and other equipment, the high caliber of the supervisory and working forces and the thoroughness with which the job was organized. The drillers were all seasoned men, most of them veterans of several other tunneling projects. The ease with which the light drills could be handled, set up and transported was, of course, responsible for material time savings. A complete Jack-drill weighs only 96 pounds, and each worker carried his machine back about 250 feet from the heading after drilling out a round and returned it to the face after mucking. Setting up to resume operations called for little more effort than connecting up the air lines.

Another contribution to efficiency was a bonus system put in effect by Mr. Dar-

ling. Extra payment was made to all workers whenever the weekly progress exceeded 150 feet. When the plan was announced it was emphasized that it must not be allowed to lower safety standards or increase the consumption of powder or the size of the crews, and a ban was placed on unwarranted absenteeism. All these injunctions were adhered to closely.

As a safety precaution, it was specified that the roof of the tunnel should be "pinned up" with bolts and plates at the discretion of the inspector representing the engineering firm engaged by the Town. Actually, the plates were placed fairly continuously, and no other form of support was employed. Bolting was done by two day-shift men. The bolts, of 1-inch Bethlehem design and either 3, 4 or 5 feet long, were driven into holes drilled with a J-50 Jackhammer mounted on a short air leg. They were tightened to a torque of 200 foot-pounds by an Ingersoll-Rand Size 514 Impactool.

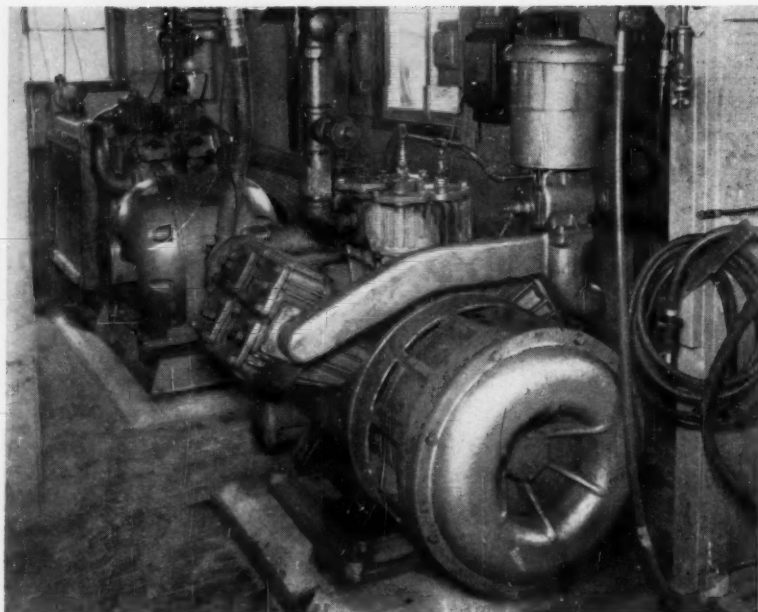
Two natural obstacles characteristic of the ground tunneled had to be overcome in conducting the work. One was gas and the other water. All deep openings in the earth in the Buffalo section yield considerable quantities of hydrogen-sulphide gas, which may originate in the gypsum or other sulphide minerals that are present. The gas is not only annoying to the workmen but also creates, in

the presence of moisture, a highly corrosive acid. In this case it attacked the air lines, locomotives, rails and virtually all other metallic equipment.

The New York State law requires that for each person on duty at least 100 cfm of fresh air must be introduced into confined workings of this kind. To be well on the safe side, 2300 cfm was regularly piped into the heading for a crew that averaged fifteen per shift. The blowers that supplied the air were shut down Friday night when work was stopped for the week-end, but were started again sixteen hours before operations were resumed on Monday.

Water, the other nuisance, was encountered in the shaft and also occasionally along the tunnel line. Wherever the flow was heavy, the ground was grouted to control it, and this called for the use of 2800 bags of cement at the worst location, about 2000 feet in. The maximum inflow was approximately 300 gpm, but most of the time it was somewhere around 260 gpm, of which about half issued from the shaft walls. The slope of the bore brought all the water to the shaft bottom, from which it was normally removed by one or more of three Ingersoll-Rand air-operated sump pumps. On week-ends, when the compressors were shut down, the water was raised with I-R Motorpumps, of which three were on hand.

Men, materials and muck were transported in the shaft by a Clyde 50-hp, electric single-drum hoist. Compressed air was furnished by a 300- and a 400-cfm Motorcompressor and delivered into the tunnel by a line that started out with a diameter of 6 inches, then dropped to 4 inches and later to 3 inches. The air left the machines at 100 psi pressure



#### SOURCE OF AIR SUPPLY

These two Ingersoll-Rand Motorcompressors, with a combined capacity of approximately 700 cfm, supplied the air power used underground. The one in the foreground is direct-connected to its driving motor; the other one is belt-driven.

and reached the heading with a drop of only about 7 psi even after the bore had passed beyond the mile mark. For use in case of power failure, an I-R Gyro-Flo portable compressor of 600-cfm capacity driven by a diesel engine was available. Similarly, a 50-kw diesel generator set was on hand ready to supply power to operate the hoist in the event of an emergency.

Tunneling was completed on January 14. The crews then began the job of driving a raise to construct the lower 10 feet of the intake riser. The upper and connecting section will be excavated from

the surface next summer within a cofferdam that will exclude the river. Lining of the bore is now being started. Concrete for the roof and side walls will be placed inside steel forms by pneumatic equipment, and the invert will be poured last.

The finished tunnel will be capable of delivering 140 million gallons of water per day, which should meet foreseeable future requirements. The water will be screened and treated and pumped to a 3-million-gallon reservoir and thence to three 1-million-gallon elevated tanks, which will insure the gravity pressure

needed to distribute it to consumers. Two of the tanks were built five years ago; the third one and the other facilities that are required to put the new supply system in operating condition are being provided under the present construction program.

A pumping station is being erected by the Pitt Construction Company, of Pittsburgh, Pa., at an outlay of \$890,000, and McHugh Construction Company, of Chicago, Ill., has a \$2,750,000 filtration and softening plant underway. Each of these will have an initial capacity of 16 million gallons per day, with provisions for readily increasing the volume to 48 million gallons. Also to be built, but not yet contracted, is approximately 6 miles of 30- and 20-inch distribution mains to cost around \$900,000. These facilities are essential because the river water will come in on the west side of the Town, whereas the present supply enters it on the east side.

Arthur O'Leary, a veteran of 27 years of tunnel driving mostly in New York and California, is superintendent of the tunnel job and Mr. Darling also devotes considerable time to it. Linwood P. Heiston is night superintendent, Joseph R. Kashner is foreman on the third shift and Raymond Wirth is master mechanic. Daniel J. Hurley is resident engineer, Stuart Rounds is chief inspector for the Town of Tonawanda and Raymond Murray is in charge of the project for the engineering firm of Nussbaumer, Clarke & Velzy.



#### PERSONNEL

Arthur O'Leary, the superintendent, above, got his early tunneling experience around New York City and during the construction of the Metropolitan Aqueduct in California. The other picture shows a group of tunnelers just after coming off duty at 11 p.m. Note the clothing the men had to wear as a protection against underground water showers. Precautions also had to be taken against gas.



## CREOLE'S HUGE GAS-COMPRESSION PLANT

Constructed on a pile-supported platform in Lake Maracaibo, Venezuela, a \$20-million facility utilizes ten gas turbine-driven centrifugal compressors arranged in seven stages to attain a discharge pressure of 1935 psi

**T**O MAINTAIN formation pressure for pushing petroleum up from a rock reservoir 4500 feet beneath the surface of Lake Maracaibo in Venezuela the Creole Petroleum Corporation is now operating a \$20-million plant that injects natural gas back into the producing bed at a rate of 137 million cubic feet per day. Located 7 miles offshore, the plant occupies a platform as large as a football field and is supported 14 feet above water level on 350 concrete piles driven into the lake bottom. It is expected that the repressuring operation will immediately raise the field's output by one half and increase its total yield of petroleum by one-third. Under construction since the first pile was driven in February, 1953, the plant was completed in August, 1954, and started up on a trial basis in the following month.

Designated as Tia Juana Conservation Plant No. 1, the facility is the first of several that are planned in order to bring about more effective utilization of the gas from the field. At its dedication on January 15, President H. W. Haight of



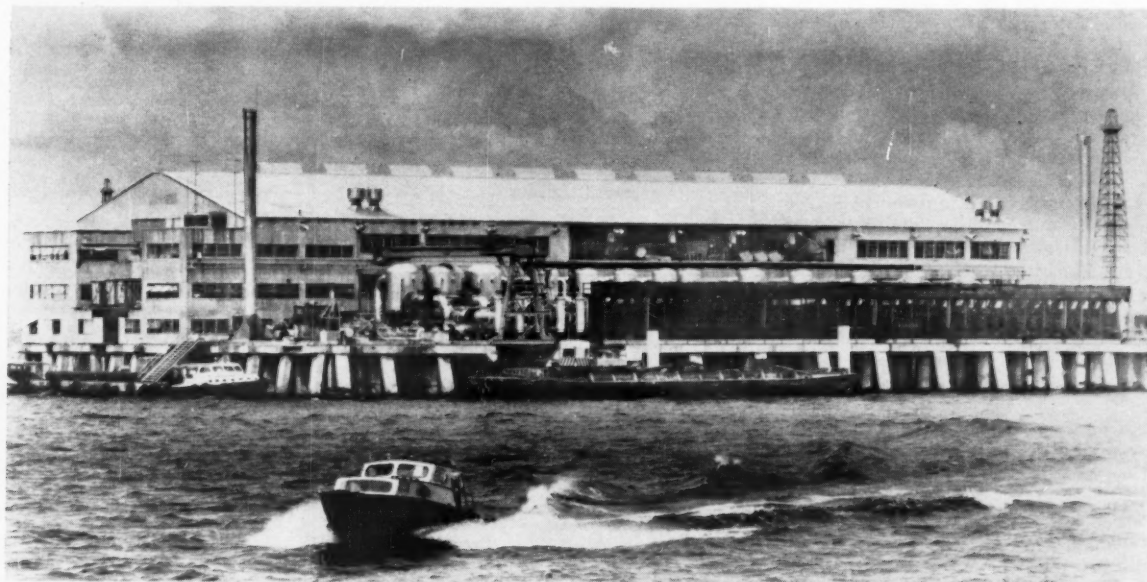
**CUTTING OFF PILE**

After concrete piles had been driven to refusal they were cut off at the top to platform height, using pneumatic tools on the concrete and torches on the reinforcement.

Creole estimated that, when the program is completed, 80 percent of the gas the corporation produces will be efficiently consumed or stored by reinjection. Creole, which is an affiliate of Standard Oil Company (New Jersey), is reputed to be the world's largest petroleum producer and has been active in Venezuela for more than 30 years. It and other operators now take about 10 percent of the world's crude oil output from the Maracaibo Basin.

The Tia Juana plant is designed to gather daily 154 million cubic feet of gas that is obtained along with oil from wells in one area of the field. After being separated from the oil at eight flow stations, the gas is delivered to the new plant through five 30-inch pipe lines at a pressure of 25 psi gauge. In order to force the gas back into the ground it is compressed to a pressure of 1935 psi gauge.

The equipment provided for this purpose is unusual. To reduce vibration on the platform it was decided to use centrifugal compressors, and this presented an engineering problem because up to



**BUILDING OVER LAKE**

Slightly more than \$20 million went into this structure on a pile-supported platform as large as a football field, 7 miles offshore and 80 feet above the bed of Lake Maracaibo.

It permits saving gas produced with oil and injecting it back into the ground to bring up more oil, thus increasing the eventual recovery by one-third.



that time no machine of that type had been built for a discharge pressure exceeding 1000 psi. Another innovation was the assembly of ten gas turbines to drive the compressors. Several turbines of this size and type were in service, but the group in the Creole plant constitutes the greatest concentration of such power plants in existence.

Of the gas gathered each day, approximately 17 million cubic feet is burned as fuel and condensed to liquids. The remaining 137 million cubic feet is compressed and returned to the ground through five injection wells. The installation of a gathering system to handle so large a volume of gas at low pressure was another problem that had to be overcome. The piping lies on the lake floor at depths of from 62 to 65 feet. Based on the average pressure drop, it was determined that line sizes ranging from 24 to 30 inches in diameter would be most economical. Some 65,000 feet of 24-, 26- and 30-inch pipe was actually laid. Special provisions had to be made to protect it against the corrosive effect of the brackish lake water and the teredos (marine borers) that exist there, and it was also necessary to add weight to give it negative buoyancy.

The procedure followed was to coat the pipe with asphalt, wrap it first with glass-fiber cloth and then with heavy meshed wire and, finally, to cast concrete around it to a thickness of approximately  $4\frac{1}{2}$  inches. This provided an average negative buoyancy of about 15 percent. The preparation and placing of the extremely heavy pipe (562 pounds per linear foot for the 30-inch size in sections up to one mile in length) in 62-65 feet of water was in itself a major undertaking.

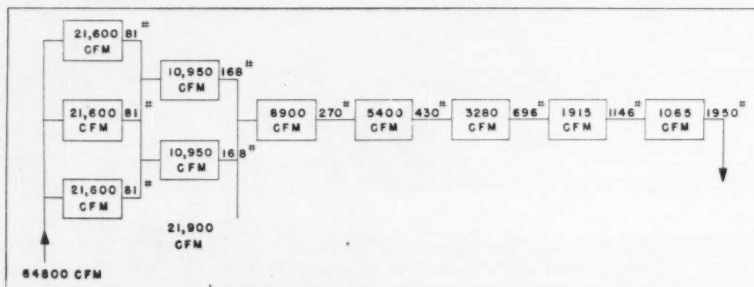
Because lines of such a large diameter could not be cleaned successfully by blowing and the interior gas pressure would be less than the exterior water pressure—with the consequent entrance of water if breaks or leaks should develop—and because of the impracticability of installing and operating "line drips," extensive measures had to be taken to prevent the entrance of liquids and to remove any that might inadvertently be admitted.

After the gas has been compressed, it is carried by 6- and 8-inch lines to the five injection wells. Approximately 8 miles of pipe was laid on the lake bed, but no weighting was needed to hold it down because it is much less buoyant than the bigger gathering lines. The compressor plant consists of ten specially designed and constructed Ingersoll-Rand centrifugal machines, each driven by a direct-connected General Electric 6000-hp 2-shaft gas turbine. There are seven stages of compression: the first stage calls for the capacity of three compressors connected in parallel to handle the large volume of gas at the low plant in-

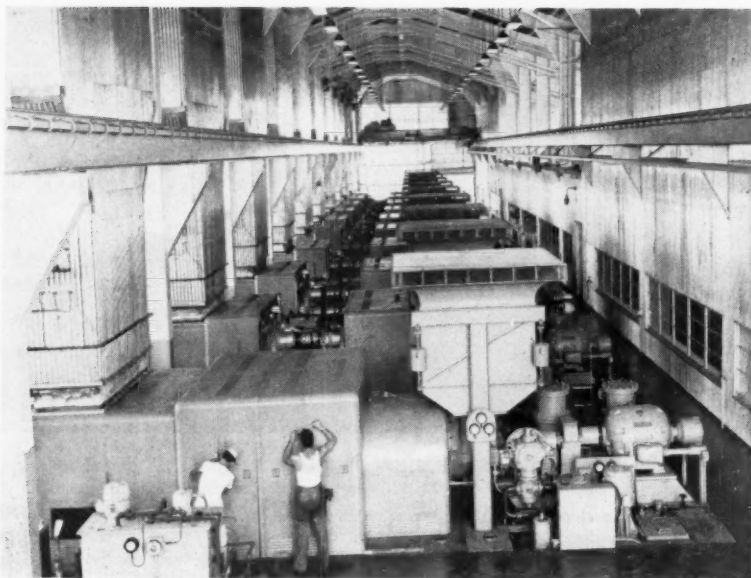


#### CENTRIFUGAL COMPRESSORS

By passing the gas successively through seven stages of compression it is boosted to the injection pressure of 1935 psi gauge, or 1950 psi absolute. This is approximately double the highest pressure previously obtained from centrifugal compressors. Of these ten Ingersoll-Rand machines the first three constitute the first stage in the cycle. There are two second-stage units and one each for the remaining stages. The diagram below shows the progression of volumes and pressures throughout the squeezing process.







#### GAS-TURBINE DRIVERS FOR COMPRESSORS

These ten 6000-hp General Electric gas turbines drive the ten centrifugal compressors to which they are connected by shafts extending through the wall at the left. In this room is the greatest concentration of gas turbines ever brought together. As fuel, the units use some of the gas that is collected from the wells each day.

take pressure (25 psig); two parallel-connected units form the second stage; and the remaining stages are handled by one compressor each.

Intercooling and condensate-removal facilities are installed between all stages. Provision is made for stabilizing the interstage condensate and pumping it to the nearest flow station for blending with the crude oil. Prior to its delivery to the injection lines, the compressed gas is cooled. Any entrained or condensed water is removed at this point to lessen corrosion, which might result if water were allowed to combine with carbon dioxide contained in the gas, and to prevent slugs of water from being returned to the formation.

The casings of the three first-stage compressors are of the cast-iron horizontally split type, those of the next three units are of cast steel and also horizontally split, while the final four for the fourth to seventh stages have forged steel, vertically split casings. Any single turbine-compressor unit can be isolated from the system without shutting down the plant. The estimated decrease in throughput with one machine out of service amounts to from 8 percent for a first-stage compressor to some 25 percent for a sixth- or seventh-stage unit.

The plant's complex control equipment is designed to take care of the multiplicity of coordinated and interlocking steps required to start and operate its high-speed machinery, to protect each compressor from surge conditions, to isolate immediately a faulty turbine-com-

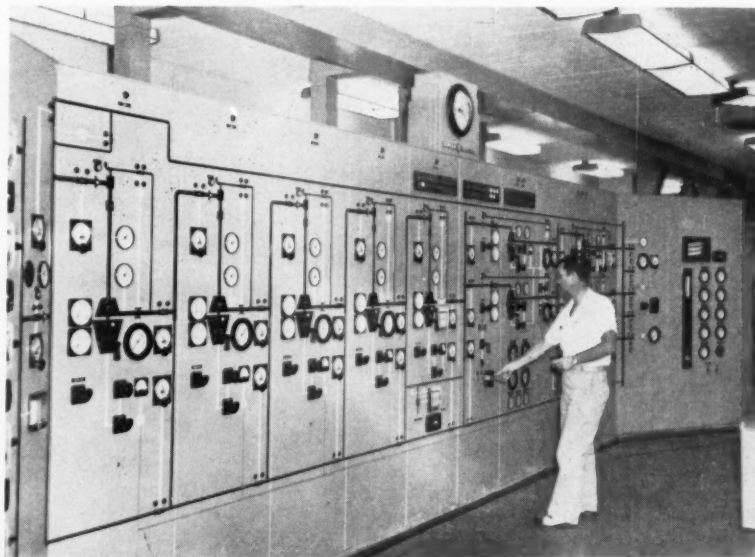
pressor unit and to provide a maximum of safety. Three of the four major control systems work in conjunction with one another in an interacting and/or overriding manner, and the fourth is a 3-way pressure-relief system. Aided by this extensive instrumentation, the plant operates with a minimum of personnel and at low maintenance cost. A large

saving is foreseen in the lower use of lubricating oil.

The plant is well equipped with an instrument shop, a mechanical maintenance shop for light work, six offices, shower-and-change rooms and a dining room. Communication with the shore is by radio-telephone and throughout the plant itself by an "inter-com" system. Personnel is transported by diesel-powered launches operating from Creole's shore installations.

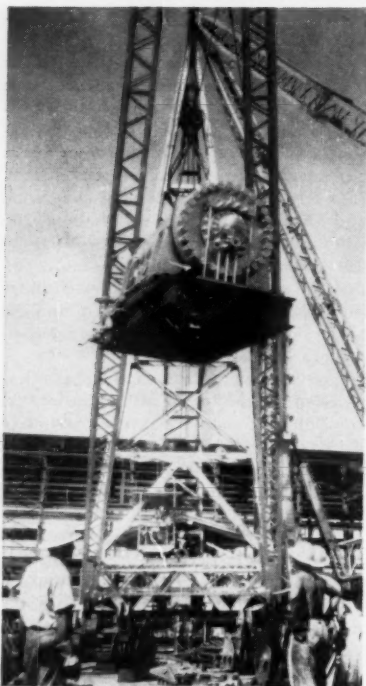
The productive horizon into which gas is injected was discovered in 1939. It is a part of the Bolivar Coastal Field and is composed of sands of the Eocene geological period. The subsurface reservoir is a permeable rock slab saturated with oil. It is composed of 85 percent sandstone and 15 percent shale and is about 200 feet thick. The top is sealed off by an unconformity, and two large faults define the side boundaries. The structure dips a gentle 3° to the southeast, and the total productive area covers approximately 9800 acres.

The deposit has two of the characteristics of all major oil accumulations in the Bolivar coastal area; it has no active water influx at the bottom and originally had no gas cap at the top. Output during the early years was entirely by the drive from gas in solution in the oil. By 1950 a secondary gas cap, formed as a result of gravitational segregation, had reached the structurally highest wells. It was apparent that even without the maintenance of artificial pressure a considerable increase in oil recovery above that to be expected by dissolved-gas drive could be obtained by assisting the



#### CONTROL BOARD

This complex control panel, which constitutes the "nerve center" of the plant, is more than 40 feet long. It was manufactured by General Electric Company and occupies a totally enclosed air-conditioned section.

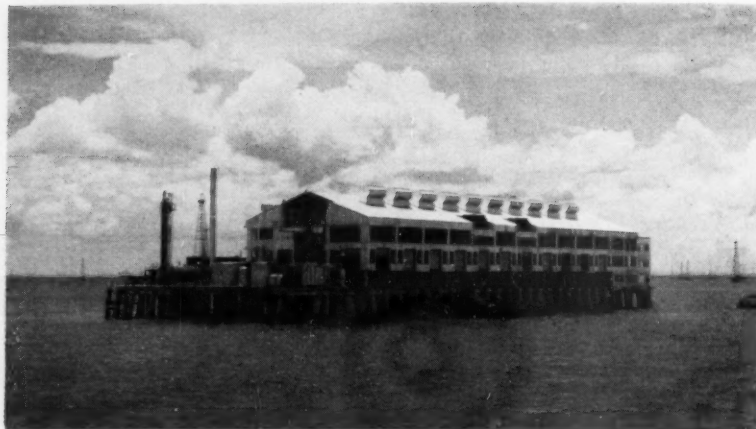


#### LOWERING A COMPRESSOR

One of the barrel-type, forged-steel-casing compressors used in the final four stages of compression being swung into place during the building period.

gravitational segregation and secondary gas-cap development. In short, the reservoir was performing efficiently as a natural-gas oil system except for the declining pressure and accompanying undesirable changes in fluid properties.

During the development of the reservoir, the importance of having cores from the productive formation was recognized, and in the case of many wells they were obtained throughout the productive thickness of rock. Characteristics of porosity, permeability and fluid saturation were thus determined. All properties of the reservoir fluids were checked to obtain accurate data on the oil characteristics. An analysis of all this information was the initial step undertaken by Creole four years ago. In view of the complicated reservoir calculations involved and the variations in the characteristics and fluid content of the producing sand it took ten man-years of work to estimate the recoverable oil under various development programs.



#### ANOTHER VIEW OF THE PLANT

Behavior of the deposit in future years was estimated under three different conditions: 1- production by natural forces; 2- production by pressure maintenance with gas injection; and 3- production by pressure maintenance with water injection. Gas injection was found to be the most advantageous method. Major benefits to be expected as a result of the operation of the new plant are that the wells will continue to produce by natural flow, that a large volume of gas will be conserved, and that oil recovery will be materially increased, as pointed out earlier.

Construction of the plant proper was begun in August, 1953, after the platform had been erected on the 350 concrete piles, each 28 inches square and

165 feet long. They were prefabricated at Creole's casting yard on shore, and a substantial saving was made by using them instead of the caisson type previously utilized in water of this depth. In areas where they were called upon to support a concentrated weight, the piles were driven to "no go" with the application of 200 tons of weight, as against a minimum of 72 tons in the case of those in less critical areas.

The platform is 329 feet long and 143 feet wide and stands some 80 feet above the lake bed. Precasting of the beams, floor sections and the ten turbine-compressor support boxes (130 tons each) on shore, and the subsequent integration of these into the platform saved materials and construction time.



#### LINE OF SCRUBBERS

Between the various stages of compression, the gas is passed through these vessels to remove impurities and condensate.

Mixes Natural Gas and  
Air to Duplicate Heat  
Value of Coke-oven Gas

## Novel Fuel-Gas System at Fairless Works

COKE-oven gas is one of the steel industry's most useful by-products. Burned as fuel in a-hundred-and-one heating operations in the mills it makes it possible to manufacture bar, sheet and tube stock so vital to our economy and essential to our comfort at a considerable saving in cost. Often, however, the amount of coke gas produced falls far short of requirements and steps must be taken to supplement the supply.

At the United States Steel Corporation's huge new Fairless Works at Fairless Hills, Pa., the basic fuel is gas generated by two 87-oven coke batteries, the difference between the amount available and the demand being made up of natural gas. It was therefore necessary to install a novel type of mixing station to inject the supplemental fuel into the distribution lines, as well as pneumatic controls to regulate the system. Before describing the installation it is advisable to discuss the operating conditions and to review some of the fundamentals that enter into the burning of gaseous fuels so as to understand the reason for the seemingly elaborate equipment. Because the capacity of the finishing mill exceeds that of the steel-making facilities continuous operation of all units is not maintained, and this results in a fluctuating load on the fuel system.

Most of us know that a given amount of air (oxygen) must be present to combine with hydrocarbons when any fuel is burned. Lack of air causes incomplete combustion with its attendant smoky discharge; if there is an oversupply, other inefficiencies may be the consequence. It can be seen, then, that there is an optimum condition for any given gas and that it is possible to adjust a burner so that all or nearly all of the combustible material will be consumed.

Different gases, however, require varying volumes of air for maximum efficiency, and that posed a problem at the Fairless Works. Natural gas has a higher heat content per cubic foot than a like quantity of coke-oven gas and therefore has to have more air. Obviously, it would not be practicable for plant engineers to run from burner to burner to readjust them every time the supplemental fuel is added, and some provision had to be made so that the amount of combustion air flowing into the burners would meet the needs of both gases.

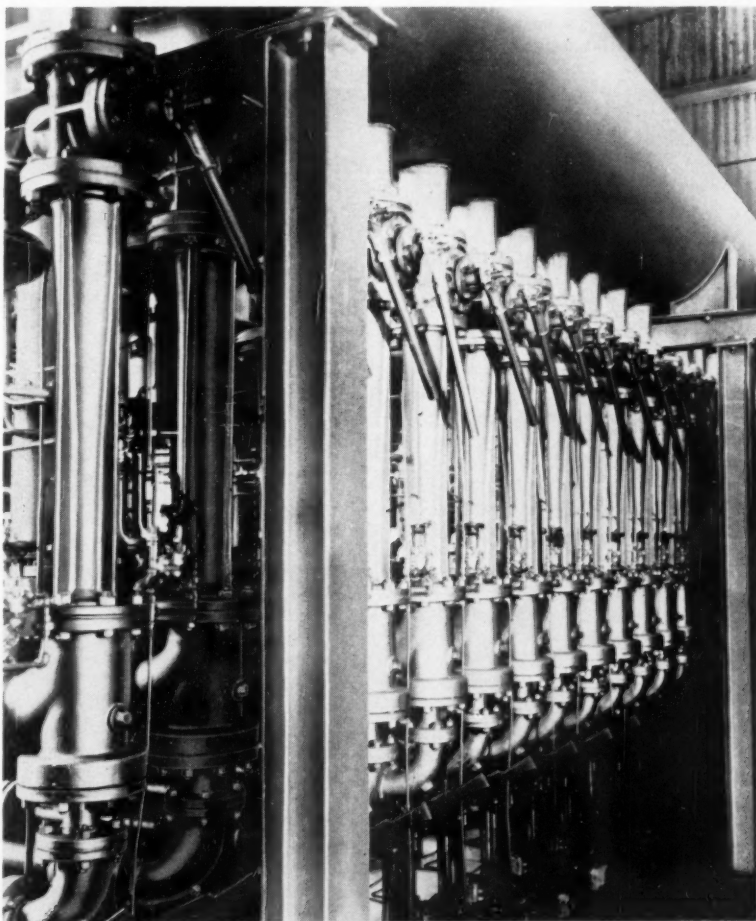
The supply of oxygen required for a given gas is related to a figure found by dividing the heat content of the gas (in

British thermal units) by the square root of its specific gravity. This is derived from the so-called Noy Formula or, as it is known abroad, the Wobbe Index. The quotient is called the heat-flow factor, and if it is the same for any two gases they can be fed interchangeably to a burner with little loss in efficiency.

When air is added to a combustible gas with a specific gravity of less than one the heat content of the resultant mixture is reduced and its specific grav-

ity is raised. It follows, then, that the introduction of a certain percentage of air to natural gas will decrease its ordinarily high heat-flow factor to that of a gas lower in the scale. At Fairless Works this calls for a mixture of 74.7 percent natural gas and 25.3 percent air, and this exact mixture must be furnished regardless of whether a thousand or a million cubic feet of supplemental fuel is consumed hourly.

Normal system pressure is  $9\frac{1}{2}$ -10 psi, the coke-oven gas being boosted to that pressure by centrifugal compressors driven by steam turbines. To get air into the system it is, of course, necessary to put it under pressure. This is accomplished by fifteen Ingersoll-Rand gas jets in three batteries of five each which take advantage of the energy in the natural gas, which is delivered to the plant at 125 psi. Although the operating



**BATTERY OF EJECTOR JETS**

Each of these fifteen tubes is a jet compressor. In operation, it receives hourly 100,000 cubic feet of natural gas at 75 psi pressure and draws in with it 31,050 cubic feet of air at atmospheric pressure. The two are mixed and discharged at 10 psi pressure. The product matches in heat value the coke-oven gas that is produced in the steel mill and either one can consequently be used without the necessity of adjusting the burners. The jets are put into service individually or taken out as the demand for gas in the mill fluctuates.



principle of jet compressors, frequently called ejectors, is well known, it is worth while to discuss it briefly.

Essentially, each unit consists of a nozzle which directs a high-velocity jet of steam or gas across a suction chamber into a venturi-shaped diffusor compartment. The air which is withdrawn from the chamber and is to be compressed is entrained in the jet and the mixture enters the diffusor, where the velocity is converted into pressure. The jets at the Fairless Works have a nozzle pressure of 75 psi and a discharge pressure of 10 psi. Each is capable of handling natural gas at the rate of 100,000 cubic feet per hour and compressing with it a maximum of 42,000 cubic feet of air. (The usual ratio at the mill is 31,050 cubic feet of air to 100,000 cubic feet of gas.)

Because of the widely fluctuating demand for fuel gas some sort of fast-acting automatic control had to be devised. Needless to say, with a new type of mixing station and a system with so many variables the initial design of the regula-

tory apparatus had to undergo several changes. Today both are functioning as they should and only one addition to the controls is to be made. The regulators are pneumatic, as has already been pointed out. Compressed air impulses from different sensing devices do the work of opening and closing valves and keeping records of what is done. For clarification, we'll follow a sequence of the regulatory reactions which occurs when the plant requires supplemental gas. (The sensing devices receive warning of a shortage by a drop in line pressure.) Let us assume that the system is operating at a stage at which not all the coke-oven gas produced is needed. In that case the coke-gas boosters are running at low capacity; a gas holder, installed ahead of the compressors in the line, is full; and the excess gas is bled.

Now let's suppose that another user of gas is put on the system and consumption goes up to a point at which more gas is being consumed than is being made. The pressure-sensing devices immediate-

ly signal the boosters to increase their rate of delivery and the gas holder steadily empties its stored load into the lines by way of the compressors until it is virtually empty. Under that condition the boosters do not have to operate at maximum capacity because no matter how hard they pump they cannot deliver more gas than is being produced. Accordingly, an overriding signal from the gas holder takes over the compressor control and directs the machines to run only as fast as necessary to force all the gas being generated into the system. Minor variations in the supply of coke gas are taken care of by the holder.

In view of the fact that mill operations are customarily scheduled to use all the coke gas being produced, it should be mentioned that the mixing-station regulators, a description of which follows, exercise main control over the system. Let us continue where we left off with our illustration; that is, with gas output below requirements. Because a further drop in line pressure cannot step up the inflow of gas from the boosters, a jet compressor is cut in well-nigh instantaneously. This is done by impulses sent out by a derivative pneumatic regulator that tends to vary the strength of its impulses according to the rate of pressure drop. These result in a series of interdependent operations that involve opening the gas and air lines to one of the jets and setting a valve which enables the next "increase" signal (if there is one) from the controller to by-pass the jet already on the system and put another one in service. In this way all fifteen jets are cut in, one at a time. Then, when a rise in pressure indicates that too much gas is being fed into the lines, the functions are reversed: the jets are cut out successively and control of the system is returned to the boosters.

It is only natural that there should be some variation in the make-up of the coke gas produced from day to day. It may differ with the type of coal used or with any one of many other factors. This necessitates the exercise of some degree of control over the heat-flow factor of the mixture and has called for the change in the basic operating pattern of the system already referred to. Accordingly, a combination calorimeter (an instrument for measuring the heat value of gas) and specific-gravity indicator is to be installed to give, in effect, the heat-flow factor of the gas. If the latter is too high, the device will signal for the addition of more air to the natural gas; if too low, it will signal for a decrease in the amount of air. In this way maximum efficiency will be obtained from both the basic fuel and the supplemental natural gas. But even without this feature the system has proved to be flexible, dependable, efficient and economical.

\*Abstract of a paper by Jack E. Webber, United States Steel Corporation



#### GIANT EXCAVATOR

This record-size Sauerman tower-type dragline moves an average of 450 cubic yards of sand and gravel hourly for a distance of 300 feet. The scraper bucket, which handles 12 cubic yards of material each trip, works between a 90-foot head tower traveling on rails at the bottom of the pit and a 50-foot tail tower 600 feet away on top of a 240-foot-high bank. The equipment is in operation on the West Coast.



## NEW WRINKLE IN TEXTILE SQUEEZING



Because a tube of compressed air exerts equal pressure in all directions at all points, it has solved the textile mill's problem of loading squeeze rolls evenly from end to end. Paper-making, rubber and printing industries may also benefit from this new development

**A** NEW idea in pneumatic roll-loading equipment for textile mills that may be applicable to other industrial fields has been introduced by Rodney Hunt Machine Company, of Orange, Mass. The purpose of roll loading is to exert the desired pressure continuously along the rolls so that they will perform their given functions without variation. In the textile industry rolls are used to produce a squeezing action in such operations as extracting excess moisture from materials, applying resin and in dyeing. All are included in what is known as the wet-finishing or dyehouse

phase of the manufacturing process.

In our grandfathers' day, textile mills used weight-and-lever assemblies or a handwheel turned against a stiff spring to load the rolls as required. In recent years the tendency has been to apply pressure by means of pneumatic cylinders. In all cases, the pressure has, up to now, been exerted on the journals at the ends of the rolls. Under this arrangement some deflection is unavoidable. The lower roll may sag because of its weight and the applied load; the upper one is often bowed upward by the pressure applied at the ends only. Conse-



### COMPLETE MACHINE

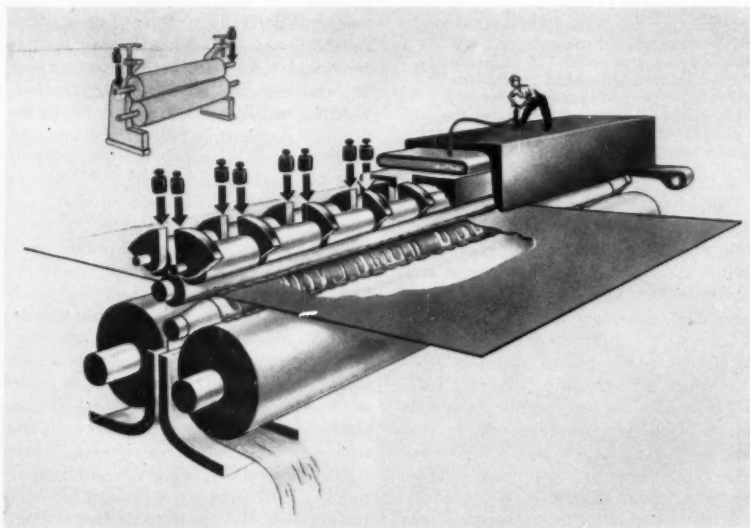
Its unique system of pneumatic loading produces uniform contact or nip pressure along the full face of the rolls regardless of their length. Starch tanks, drip pans, batchers and other accessory equipment may be readily attached.

quently, pressure is uneven, being greatest at the ends and decreasing gradually toward the center of the nip or contact line, where there may be a considerable differential.

Cut-and-try corrective measures are often resorted to in an effort to obtain uniform nip loading. One roll may be crowned to fit the bow in the deflected mating roll; or one may be skewed with respect to its companion. Either remedy suits but one operating condition. Deflection can be lessened by increasing roll diameter, and the use of a softer-rubber roll covering will compensate for it to a limited degree. However, both expedients spread or broaden the nip contact, thus reducing the unit squeeze pressure, or pounds exerted on each square inch of fabric, and starting a vicious circle.

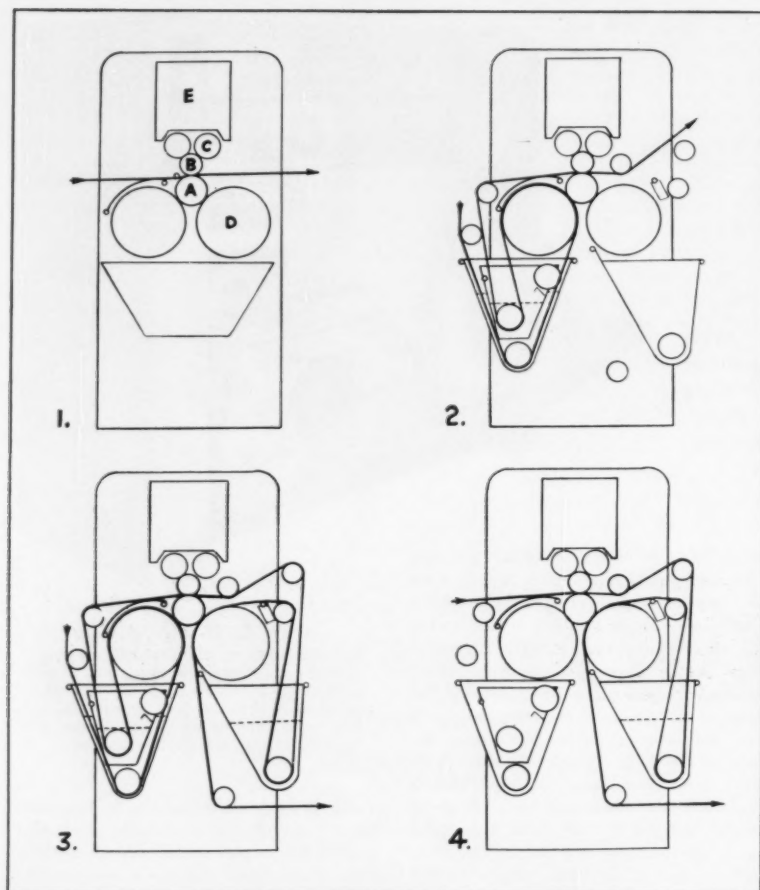
The Rodney Hunt organization contends that the word "pressure" has been widely misused in this connection. Although it is defined as "force exerted per unit of area," the term has been erroneously applied to describe the total nip loading and also the force exerted per linear inch of nip. Actually, it is pointed out, neither value in itself is adequate as a means of rating the performance of a squeezer or padder. It is the unit pressure (pounds per square inch in the actual contact area) that counts, and this depends upon loading, roll diameter and roll-surface characteristics.

To give satisfactory results, any ex-



### OPERATING PRINCIPLE EXPLAINED

Air pressure in an inflated tube at the top is applied to a steel plate that bears against the brackets of a pair of segmented rolls placed side by side. From these rolls the pressure is transmitted, in turn, to other lower ones in the series. The arrows indicate the several points where pressure is exerted along the full length of the rolls. This is in contrast to the older method of applying pressure at the end of the rolls only, as indicated in the small illustration at the upper left. Under such an arrangement the pressure decreases from the ends towards the middle.



#### DIFFERENT CLOTH-THREADING PATTERNS

Figure 1 shows the positions of the rolls and how cloth is run through them in the case of a simple extraction operation. "A" is the soft-covered pressure roll, "B" the steel roll and "C" one of the pair of segmented pressure rolls. "D" indicates one of the two identical support rolls which are covered with hard rubber and "E" is the channel containing the pneumatic loading system. Figure 2 shows how the mangle is threaded for resin application and dyeing. Figure 3 illustrates the threading arrangement that uses all three possible nips or pressure contacts. Figure 4 is the threading diagram for continuous moisture extraction and starching.

tractor, mangle or padder must, Rodney Hunt technicians say, be capable of exerting pressure precisely and uniformly across the nip; of providing resilient loading so that seams or material of varying thicknesses will pass through the nip without damaging the fabric or rolls; and of applying and conventionally controlling the unit pressure specified for the textile and processes concerned. Further, it must have roll surfaces that will do the work without damaging or stretching the fabric.

The Niptrol pneumatic mangle, as the latest Rodney Hunt machine is called, is said to be the first of its kind to combine these desirable features. It squeezes effectively because it exerts high pressure evenly the full length of closely set rolls. There are four primary and two supplementary rolls arranged so as to provide three nips or pressure application contacts.

The pressure system consists of an inflated tube or air bag that transmits its uniformly distributed pressure through a flexible steel plate, bearing against self-adjusting brackets, to two staggered segmented short-face pressure rolls. The latter, in turn, apply the force to a small-diameter top nip roll of stainless steel. The lower primary nip roll, or "soft" roll, is cradled between and bears against two hard-rubber covered support rolls that are rigid enough to undergo little deflection. This permits using a lower nip roll of small diameter.

Because the air in the pneumatic tube distributes itself in accordance with the relative resistance offered, pressure is automatically apportioned as needed along the transmission rolls to compensate for deflection at every point along their faces. And as the diameter of the primary nip rolls is small, the nip contact area also is small. It is a band only  $\frac{3}{16}$

inch wide which maintains a uniform nip the full length of the rolls as a result of the even pressure applied by the pneumatic tube.

When the air pressure within the tube is 43 psi, the Niptrol system produces a maximum loading of 250 pounds per linear inch of rolls. This, with the  $\frac{3}{16}$ -inch contact band, is equivalent to 1333 psi on the fabric. The total load for material 64 inches wide would be 17,250 pounds. On the other hand, a conventional heavy-duty extractor or padder, with 18- or 20-inch-diameter rolls and 30,000 pounds full loading, usually has a contact band between rolls at least  $\frac{1}{2}$  inch wide. For a 70-inch roll face this is equivalent to 429 pounds per linear inch and only 858 psi on the textile. It will be apparent from these facts that Niptrol loading, with its narrow contact band and 55 percent greater pressure on the fabric per square inch, will produce considerably better results.

Extraction and starching—which are usually done at the same time—are said to be accomplished with unusually high efficiency and economy. The same is true of resin application and dyeing because the chemicals, of which relatively small quantities are used, are caused to penetrate the fibers of the material uniformly and deeply. Consumption of chemicals is markedly reduced, deposition of resin on the surface of the cloth is avoided and the finish of the fabric is improved. Resins are applied, among other things, to make textiles both crease and water resistant.

The special construction of the lower primary or soft roll also contributes measurably to the results obtained. The synthetic material used is such that it conforms closely to the weave or pattern of whatever fabric is being treated, yielding readily to accommodate the individual yarns while filling the interstices to exclude water pockets. The narrow contact band permits the effluent to escape easily from the nip, leaving the moisture content of the textile after extraction close to its natural point.

In general, the Niptrol unit is suitable for processing cotton, linen and wool fabrics, as well as acetate-viscose blends, nylon, spun rayon and other synthetics. In addition to the operations mentioned, it can be used to treat wet cotton goods with a caustic in the mercerizing process that increases its luster and strength and makes it more receptive to dyes.

Machines embodying the same pneumatic-tube loading principle have been in service in European mills long enough to gain wide acceptance, but the idea is new here and patents have been applied for. In addition to its use in the textile field, it is expected to have numerous applications in the paper, rubber, plastics and printing industries, all of which are in need of means that will accurately control roll pressures.



Lightweight air drill



Mounting tire



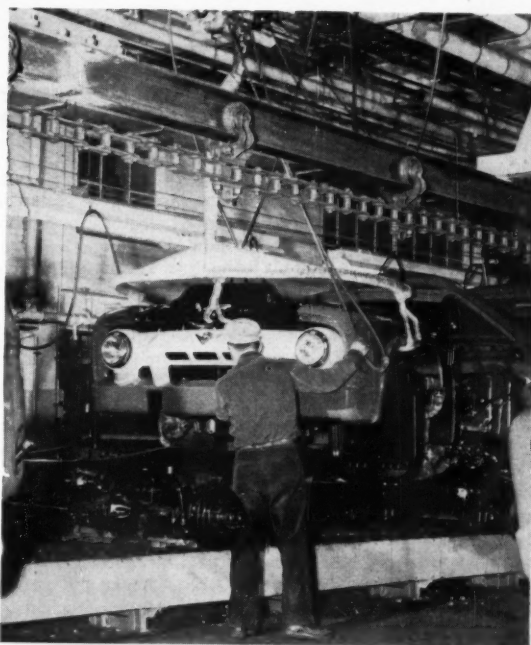
Spray painting

## Air Power at Ford

**U**NDER the heading "Air Power Packs a Mighty Punch" the *Edgewater News*, employee publication of Ford Motor Company's assembly plant at Edgewater, N. J., recently called attention to the numerous labor-aiding services performed by compressed air. It was noted that "710 machine operations, which would be slow, laborious processes if done by hand, are completed quickly and efficiently by air power." To keep them going, eight electric-driven units compress 5590 cfm of air to 105 psi pressure and cool it to 90°F. Five men devote full time to maintaining air tools in good working condition, and spare units and parts are available in quantity for immediate replacements or repairs.

"Compressed air as a power agent," it was stated "can do many things. No job is too great or too small. It drills, drives and dries. It pushes, paints and polishes. It inflates, it syphons, it lifts. It grinds, it welds and it rivets. To the approximately 600 assembly workers here, air power is a miniature jet that packs a mighty big punch."

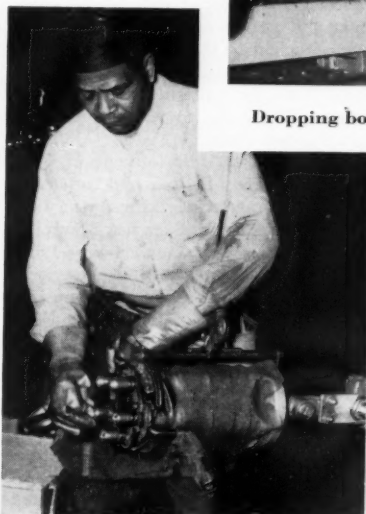
Typical Edgewater air-power jobs are illustrated through the courtesy of Allen P. Crawford, editor of the plant publication



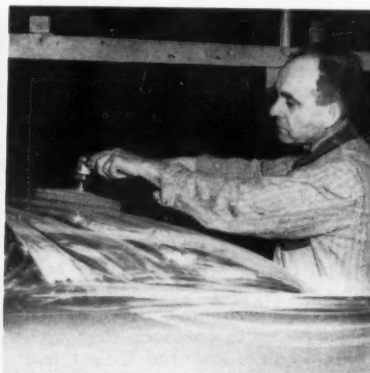
Dropping body onto chassis with air-operated hoist



Screw driver with clutch that can be set for desired torque

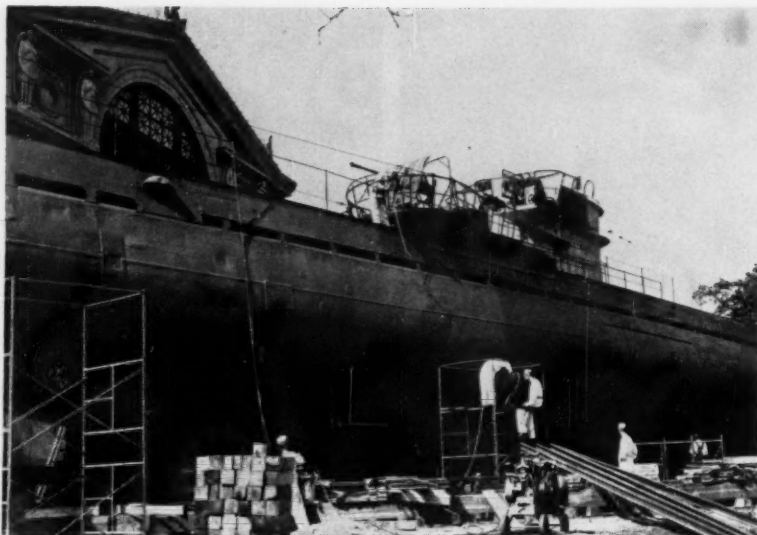


Multiple tool for running nuts on lugs of car wheels



Grinding surface of trunk with angle-type air tool





## Chicago Museum Has Former Nazi U-Boat

THE scene was a shipyard, bustling with the activities of a launching. Speeches were made, a flag was raised and a proud skipper entered the following notation on the flyleaf of his logbook: "We Sail Toward England." That happened on August 26, 1941, in Hamburg, Germany. The occasion was the launching of Submarine U-505, latest addition to Hitler's deadly fleet of undersea marauders. That date is now marked in the annals of American naval history. Here's how it happened.

Seven months after the U-505 slid down the ways the logbook recorded her first kill, a 6000-ton British freighter, off the coast of Africa. By November, 1942, she had sunk eight ships, among them three American cargo carriers. Other entries included a bombing, in which the boat was battle-scarred, and a change in captains.

One of the most important events in the life of the sub was never recorded because no one was left to make the entry. It occurred off the coast of Africa on June 4, 1944. On that day the crew was sitting down to lunch. Suddenly, under the attack of depth charges, the craft was shaken by heavy explosions. A panicky crew member cried out that the forward torpedo room had been broached. In the control room the skipper, upon hearing this report, ordered the vessel to the surface. (Actually, she had suffered no damage—the sailor had seen bilge water sloshing about and thought the hull had been punctured.) As the gunners rushed to the deck they were met by a hail of lead; the U-boat had bobbed up in the midst of an American naval task force.

Believing that their ship was about to

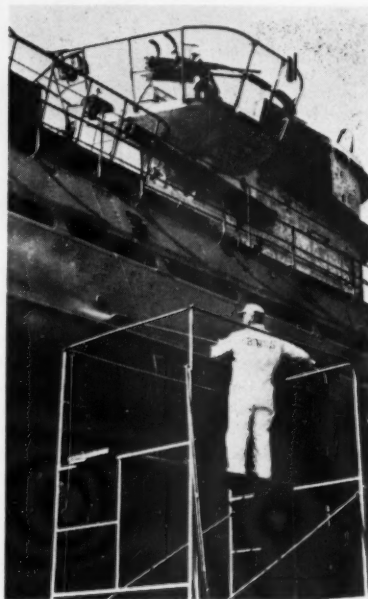
sink, the remainder of the men leaped into the Atlantic. At that moment a historic order boomed from the amplifiers on the "jeep" carrier *Guadalcanal*: "Away all boarding parties!" Quickly a specially trained crew raced their whaleboat to the wallowing submarine. Fearful that she would explode any minute because of time bombs, the American sailors hastened below decks. Hurriedly they disconnected the detonators and closed a sea cock through which an 8-inch stream of water was rushing into the control room.

Capt. Daniel V. Gallery, commander of the task force, had realized his special dream—the capture of a German U-boat, together with important naval code books and an "acoustic" torpedo. Lines were attached to the craft and she was secretly towed to the Portsmouth, N.H., Navy Yard for examination by naval experts. There she lay rusting for more than thirteen years.

Now, the U-505 sits outside of Chicago's Museum of Science and Industry, a permanent memorial to those who died in both World Wars. Each day hundreds of visitors stream through the vessel, inspired by the bravery of her American captors. For the most part they are unaware of the many individuals and industrial firms responsible for bringing the submarine to its land-locked berth. Without their financial aid, donated services and materials, it would have been impossible to transport the craft to Chicago. She was carried by dry dock to a beach about 600 feet from the museum, which is located on the shore of Lake Michigan. Late at night, on special rollers and cribbing, she was moved across Chicago's busy Outer Drive, and it took

### SPRUCING UP

Workmen are shown at the left cleaning the hull and applying preservatives with the submarine only inches away from its final resting place, a steel-and-concrete cradle. A patch on the hull covers a shell hole that was made during the capture of the boat by a U. S. Navy task force. The top of one wing of the Museum of Science and Industry is visible at the upper left. The other picture is a close-up of a worker applying Rust-oleum with an air spray gun.

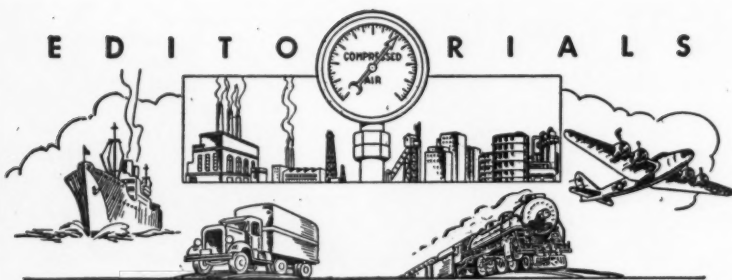


weeks to inch the huge hull into place alongside the building.

The submarine was in very bad condition on her arrival, even though she had received a rough coat of paint at Cleveland on her way through the Great Lakes. The entire boat was severely corroded with layer upon layer of rust. To improve the appearance of the memorial and to prevent further deterioration, several Chicago firms donated their services and materials. The Chris Paschen Maintenance Corporation sandblasted the hull, a task made doubly difficult by the fact that the work had to be done while the sub was being pulled, foot by foot, into position. The Rust-oleum Corporation of Evanston, Ill., applied three coats of Rust-oleum, and the Chicago Safeway Scaffold Corporation provided the metal scaffolding that was used to reach the top of the 3-story-high craft.

At last, after a fight with time and weather, the sleek black-and-gray U-505 was ready. On September 25, 1954, formal dedication ceremonies were held with Fleet Admiral William F. Halsey as principal speaker and Arthur Godfrey as master of ceremonies. The U-505 will roam no more.

## EDITORIALS



### RESEARCH ON TEMPERATURE

EVERYBODY is interested in heat or the absence of it. Radio stations repeat the temperature every morning so that we may know how to dress when we go out. Some affluent people travel about during the year to escape the extremes of heat and cold; others even change their place of abode to a balmy climate. Temperature concerns human beings of all ages. Baby's bottle, father's highball, grandmother's cup of tea and grandfather's toddy must all be suitably cooled or warmed. The housewife deals with temperature every time she boils an egg, cooks a roast or makes a frozen dessert. Doctors take the temperature of every patient at the outset of an examination. Every motorist relies on a cooling system to keep his car's engine from overheating.

Temperature control is important to many industrial processes from the making of steel to the refrigeration of orange juice, and permissible deviations from the prescribed figures are continually being shaved. In the field of science temperature is of vital significance, and it is growing more so as the realms of extreme heat and cold are further explored. Aviation has created a need for developing some alloys that can withstand the inferno of the jet engine and others that are immune to the effects of the frigid air found at great heights. In short, as the National Bureau of Standards points out, "temperature ranks as one of the most important of the physical quantities, and its measurement and understanding have provided some of the most difficult and challenging problems in the field of physics."

In an effort to settle some of these problems, international symposiums are held periodically to provide a place for the exchange of information between the various groups that work with extreme temperatures and precision temperature measurement and to stimulate research in these fields. The first one was held in Chicago in 1919, the second in New York in 1939 and the third at the National Bureau of Standards in Washington last October. More than 400 scientists from this country and abroad attended the last one and 25 technical papers were presented.

Man got along without temperature-telling instruments until a few centuries

ago. Galileo devised one of the first of them and called it the airtroscope. It consisted of an air-filled hollow tube, bulbed at one end and immersed in colored liquid. It wasn't dependable because it was affected by variations in atmospheric pressure. The first thermometer of the present liquid-using type is attributed to Grand Duke Ferdinand II of Tuscany and dates from 1654. It was used by a small group of scientists who worked under his protection. The liquid was alcohol, and the divisions marked on the tube corresponded with thousandths of the bulb's volume.

The next development was to fix two points on the tube and divide the intervening space into degrees. The temperature of the human body was agreed upon for one of the points. In 1714, Gabriel D. Fahrenheit designed a thermometer that indicated the temperature of a mixture of salt and ice as zero and the body temperature as 12°. The latter was subsequently changed to 96°, and still later the same scale was projected to the boiling point of water at sea level and came out as 212°F.

For scientific work, Celsius created the metric system Centigrade thermometer in 1742 with a range of 100 degrees between the freezing and boiling points of water. Scientists subsequently evolved the absolute or K-scale, which goes down to absolute zero at approximately minus 273.1°C. As the physical laws pertaining to the expansion of gases are simpler than those governing liquids, gas thermometers are superior for scientific purposes, especially in the realm of cold. Mercury, being liquid at normal temperatures and exhibiting about the same expansion characteristics as gases, was selected for ordinary thermometers.

Possible new thermometers suitable for measuring temperature extremes were discussed at the recent meeting. The American Institute of Physics will publish the full proceedings before next fall in order that scientists the world over may study them and offer helpful suggestions. When sufficient additional, worthwhile progress has been made towards solving some of the problems, another symposium will be called by joint action of the interested groups, including the research branch of the U. S. Army.

### CLEAR SAILING FORECAST

EVER since local water-distribution systems replaced town pumps some skeptics have been afraid that we might invent ourselves out of employment. The appearance of type-setting machines made printers indignant, the coming of railroads riled up the teamsters, and so on with many improvements right down to the present. As wages increase, inventors think up new ways to do things with machines. The machines, in turn, enable men to produce more and hence earn more, and they can then spend more. The more they spend, the more employment they create in order to make, transport and sell the things that are in increased demand. So it all doesn't work out the way some people fear it will.

When the automobile came within reach of almost everybody's pocketbook and stimulated employment to undreamed-of proportions the gloom casters said that was fine, but wouldn't things go to pot when the market became saturated? What actually happened? For one thing, the market isn't saturated yet, and even with people buying well over five million cars a year a large percentage of all drivers have never owned a new one. For another thing, the airplane came along and it, too, became a great employer.

About that time the pessimists were dead certain we were running out of new industries to bolster our economy. What, they asked, was there left to invent? Since then radio, television, radar, nuclear power, guided missiles, gas turbines and all sorts of electronic gadgets have come along, to say nothing of plastics, new metal alloys and other innovations. And how's employment? Well above the 60-million-mark, which seemed unattainable less than twenty years ago.

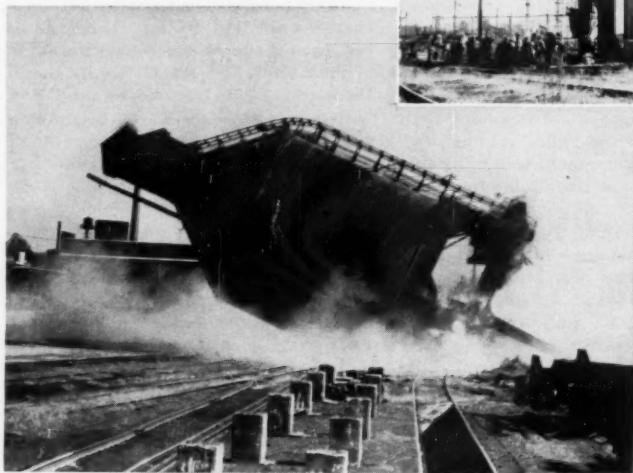
Apparently our governmental and industrial leaders don't think the economic procession is going to slow down for a while, even though defense expenditures are being whittled down. For example, Dr. Charles N. Kimball, president of Midwest Research Institute, a nonprofit organization of 200 scientists, says we can expect a bumper crop of new products to come out of the laboratories this year. We're spending more than \$3,000,000 annually in industrial research, and it is paying off. Big companies like Du Pont now get more than half their income from products that were unknown 25 years ago and go on adding new lines year by year.

The same sort of rosy prophecy comes from F. J. Souday, vice-president of Chemstrand Corporation, a joint venture of American Viscose Corporation and Monsanto Chemical Company that will soon be making nylon and acrilan, a new wool-like synthetic fiber. His prediction is: "The next decade will see construction of at least 200 new multimillion-dollar plants to manufacture products which do not even exist today."

## Old King Coal Bows To New King Oil

THE accompanying pictures graphically portray the story of coal's losing battle with oil for the job of fueling the nation's locomotives. They show the inglorious end of a coal-dispensing tower in the John Sevier yards of the Southern Railway System at Knoxville, Tenn. The concrete structure, which had served coal burners for half a century, was toppled to the ground as part of a multimillion-dollar improvement program.

Eighteen holes were drilled in the nine supporting columns with Jackhammers supplied with air by an Ingersoll-Rand portable compressor. Some went in



straight for 16 inches; others were at an angle of 45° with the face and up to 28 inches deep. They were loaded with twenty-six 1¼x8-inch sticks of Atlas 40-percent dynamite with an ammonium-nitrate base and fired by ordinary time fuses with No. 6 blasting caps connected to Primacord. Time fuses were used to eliminate the possibility of premature detonation by sneak currents from rails, overhead power lines, communication circuits, radio energy or lightning. Sandbags, barely visible in the top picture, were placed to prevent pieces from flying and to protect nearby structures. After the tower was down, further light blasting and derrick work reduced it to pieces that could be readily handled for disposal.



## This and That

### Speeding Ticket Selling

To ease the lot of the long-distance train traveler, the Southern Pacific has streamlined the process of purchasing tickets in a new office opened in San Francisco, Calif. A husband and wife bent on buying transportation to New York, for example, place their order over a dual-position telephone in the lobby that enables both to be in on the conversation. Upstairs at a switchboard a clerk takes the order, checks the available space on the train wanted, then passes the order along to a rate clerk who checks it and makes up a book ticket that he sends by pneumatic tube to an assignment clerk downstairs. The latter puts the ticket in an Addressograph machine called Ticketmaster which prints the sequence of routings from a set of plates and totals the charges. He then hands it to a cashier, who has the couple paged to his window where the transaction is completed.

Plates for the Ticketmaster are available for all usual routings, numbering

about 500. The new system saves a great deal of time: 125 tickets from San Francisco to Sun Valley, Idaho, for instance, can be turned out in nineteen minutes as against five hours under the former routine. For longer trips with more complicated routings the time requirement has been cut in half.

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### Peary And His Caboose

In March, 1953, we published an article by Roy E. McFee of Detroit on railroad cabooses. Some weeks ago, while looking through his file of back issues, Richard W. Canfield, senior vice-president of Clemson Bros., Inc., of Middletown, N. Y., reread the article and then wrote us a letter. Why, he asked, didn't the author mention the fact that Admiral Peary took an Erie Railroad caboose with him on one of his northern exploratory trips? We couldn't answer the question because we had never heard the story, so we asked Mr. Canfield if

he would give us the particulars. In due time we received the following reply from him:

"I can now inform you that the caboose was on Admiral Peary's four-year expedition of 1898-1902 and that the admiral used it as his headquarters on shore at Etah, Greenland. There is an account of it in the appendix of *Nearest the Pole*, but no pictures. The book *Children of the Arctic*, by Josephine D. Peary, published by F.A. Stokes in 1903, has a picture of the caboose on page 43. Mrs. Edward Stafford, the admiral's daughter, of Portland, Me., very kindly wrote me as to where I had seen the picture, so we can consider the information as authentic."

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### Windmill Power in Australia

Wind-measuring instruments are to be installed along the coast line of South Australia as the initial step in a project that may make that state the first on the Australian Continent to harness the wind for the large-scale generation of electricity. The survey will cover a stretch 600 miles long and use instruments of the rotating cup-anemometer type mounted at a height of 30 feet. Some of them will keep an hourly written record of velocities; others will check the average volume and constancy of area winds.

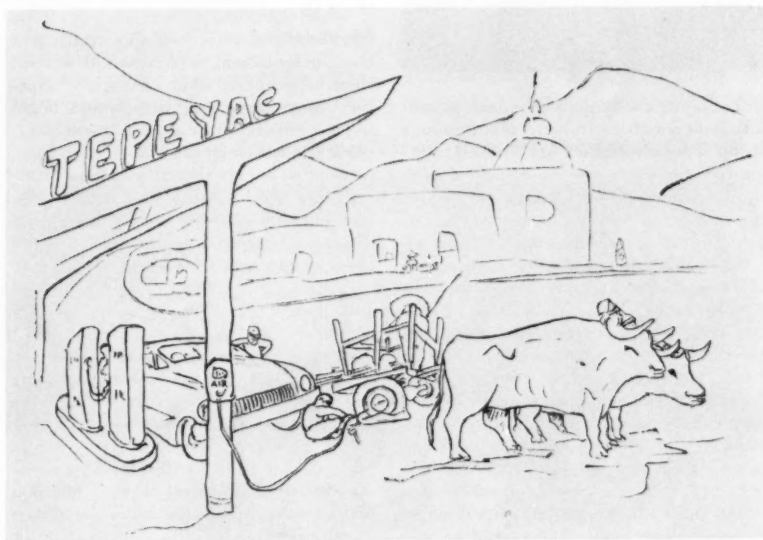
L.F. Mullett, head of the planning department of the South Australian Electricity Trust, reports that there are some 20 to 40 sites between Adelaide and Victoria Harbor where, if results warrant, stations can be built. They would develop approximately one-third the power now being produced in South Australia.

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### Be Safe And Eat Steak

Safety is of paramount interest in the petroleum industry, and the exercise of adequate precautions has taken most of the hazards out of the rough-and-tough work of drilling wells. The most satisfactory result of being safe is the continuing privilege of enjoying life unhampered by physical handicaps, and in that respect safety is its own reward. However, safety is good business, and management often takes note of it and encourages it in some tangible way.

In Salt Lake City, Utah, eighteen employees of Mountain Fuel Supply Company and their wives recently sat down to a steak dinner as the guests of the firm's president, W. T. Nightingale. The men comprised the drilling crews of Rig No. 1 and had just completed eighteen months of accident-free work. During



### WEDDING OF OLD AND NEW

When Stacy H. Hill, of Salt Lake City, Utah, was touring Mexico recently, he reached an oasis in the middle of a 125-mile stretch of desert on a Sunday and stopped to have a flat tire repaired. While this was being attended to, an ox-drawn cart driven by a native came lumbering into the service station. The yoke on the huge animals was hand hewn and the vehicle was plainly very old, but it had one modern touch—pneumatic tires. Questioning revealed that the Mexican regularly made the trip from his ranch home some miles away every Sunday to inflate the tires. Mr. Hill was much impressed because he had recently retired after spending all his adult years selling compressed-air equipment for Ingersoll-Rand Company. He had no camera along to record the scene, but with him was his son-in-law, Perez Lopez of Monterrey, Mexico, an art student, who obliged with the accompanying sketch. Compressed air is, of course, the agency that keeps this marriage of the old and new off the rocks.

that period they had put down 38,108 feet of hole, moved the rig seven times, finished six gas wells in four different fields in Colorado and Wyoming and piled up 53,720 man-hours without a mishap and with no major shutdown for rig repairs.

During this period the crewmen drove an average distance of 120 miles per shift to get to and from work—at times through snow and mud. Mr. Nightingale expressed the opinion that the record had never been equaled in any other deep-well drilling operation in that section of the country.

★ ★ ★

#### 162-ton Vessel Hauled

El Paso Natural Gas Company is thought to have set a record recently by hauling a 324,000-pound load a distance of 30 miles overland in west Texas. A 77-foot-long deëthanizer tower was moved from a railroad siding at Benedum, Tex., to its Midkiff gasoline plant and compressor station. Because the burden exceeded the legal weight (26 long tons) permitted on Texas highways by 265,760 pounds, it negotiated the sandy "borrow strip" flanking the paved roadway. To support the long and heavy tower, the company rigged up a special vehicle having trucks consisting of crawler-traction units. It was pulled by two tractors and made the trip in a day. The same equipment was used later on to haul smaller vessels.

★ ★ ★

#### Safety In Roof Bolting

Roof bolting, about which we have published several articles, is given credit for substantially improving safety conditions in Pennsylvania coal mines. The number one killer in collieries is the falling roof. In the first ten months of 1953 it crushed to death 73 miners, as compared with 39 in the corresponding period of 1954. More than half of the fatalities in recent years have resulted from removing timbers. As roof bolting replaces timbering it automatically reduces accidents of this type. Actually, the Pennsylvania Mines Department reports, there was no fatal mishap during the first ten months of last year in sections of mines where roof bolting was employed.

★ ★ ★

#### Unique Display Of Tools

A machine-tool "super-market" in Brooklyn, N. Y., is claimed to have saved 15,000 industrial executives 300 million miles of travel during its first year of operation. Officially called the First International Machine Tool Exposition, it is a permanent working exhibit of repre-

sentative machine tools from all over the world. To see them at the factories where they are built would require a journey of 20,000 miles. The display is sponsored by a group of tool manufacturers and is open to the public, without charge, every weekday.

★ ★ ★

#### Rubber Railroad Crossing

The man who first said there is nothing new under the sun has again been proved in error, for the Goodyear Tire & Rubber Company has built a rubber railroad crossing—the first in the world. Placed on the main tracks of the Erie Railroad at Wilbeth Road in Akron, Ohio, it is predicted that installations of this kind



will eliminate a major annoyance to motorists and reduce railway maintenance costs. Its possibilities are well-nigh unlimited, for there are thousands of such crossings throughout the country over the tracks of railroad systems and of shipping areas that intersect highways.

The rubber roadway is constructed of 36x59-inch slabs, each a little more than 3 inches thick. They are molded of special wear- and skid-resistant compounds complete with a sheet of heavy-gauge steel sandwiched in between, tapered flanges on the outer edges and a diamond-shaped design on the surface. The slabs are laid on heavy, treated-wood planking which rests on the ties and are fastened by 12-inch-long lag screws inserted in metal and rubber grommets to insure a tight hold. When wedged between the rails, the flanges form a tight seal that prevents seepage which would cause fouling of the ballast and deterioration of the ties. Smaller slabs placed on the outer sides of the track also are designed to form a water-tight union.

★ ★ ★

#### Perils Of the Baker

Human nature apparently hasn't changed greatly through the centuries. In the article *Baking Our Daily Bread* in our January issue it was mentioned that regulations concerning weight, price and purity of

bread have been in force since the first century A.D. and that a few hundred years ago the Turkish authorities kept the price down simply by hanging a baker now and then by way of impressing the other members of the craft.

Even while the article was on the press it developed that less drastic but still severe measures are currently invoked to keep charges under control. On December 31 newspapers throughout America published an Associated Press photograph showing a baker in Kena, Egypt, 300 miles up the Nile River from Cairo, being publicly flogged for alleged profiteering during a food shortage.

★ ★ ★

#### Professor Sandblasts Old Bones

Sandblasting equipment has been used through the years for a variety of purposes but never for a more unusual one than is reported from Nevada, where University of California paleontologist Charles Camp has been removing fossilized bones from the ichthyosaur graveyard in the Shoshone Mountains east of Fallon, Nev. (An ichthyosaur is an extinct marine reptile with the body of a fish and four paddlelike flippers.)

When the bones were taken from loose limestone and shale their appearance was that of limestone, which would not set them off properly when on display. Doctor Camp knew that they would begin to look natural after several years of exposure to the elements but, to save time, he decided to experiment with sandblasting. He tried out the idea with equipment borrowed from Nye County, and it was so successful that he is treating all the specimens in that manner.

★ ★ ★

#### Isotopes Determine Tool Wear

Tracer radio isotopes were recently used by a government research staff to measure the rate of wear of machine-tool bits. Radioactivity transferred from the tools to the chips they created while in service constituted the basis for determining relative tool life. This is a much faster method than the conventional one of running a tool to complete failure or until a predetermined amount of flank wear has been measured with the aid of a microscope. Tool bits made of two different materials were applied to two types of steel. After the initial "break-in" period, tool wear was essentially uniform. The greatest rate of wear was found to be at the highest operating speed, although wear increased markedly at excessively low cutting speeds. The experiments were conducted at Rock Island Arsenal with four bits that were irradiated at the Oak Ridge National Laboratory.

## Automobile Rides Road or Rails

**A**N AUTOMOBILE that can travel on either highways or rails is used by President Alfred E. Perlman of the New York Central System for making inspection trips over the line. It is a conventional Chrysler car equipped with oversize tires and extra axles both fore and aft fitted with small flanged railroad wheels. These are elevated a few inches when the vehicle is running on a highway.

In going from road to rails, the driver seeks a crossing, jockeyes the car into position with the tires on the rails and brings the flanged wheels in contact with the track. This is accomplished by means of an air cylinder that receives its power from a compressor operated by the automobile engine. The car actually runs on the tires; the function of the steel wheels is to keep it on the rails.

The automobile was outfitted in the railroad's Cleveland, Ohio, shops last August and by the first of this year had logged 3000 miles on the Central's lines, with either Mr. Perlman or one of his assistants in it. It is designated officially as Train X-100, and when traveling the rails is subject to the same regulations and safeguards as small work cars. Its presence in a division is known to all the operating personnel, and it is given a



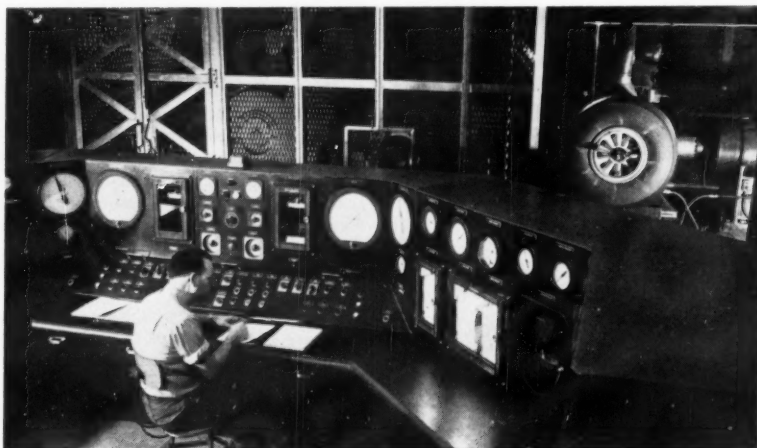
### TAKING TO THE RAILS

Interested spectators watch the driver maneuver the road-rail car into position on the tracks at a crossing. The small flanged wheels visible at the front and rear are lowered by air pressure, after which it is necessary only to lock the steering wheel and step on the gas. Note car's official number and running lights on top of it.

schedule to follow at the entering signal tower so that it won't interfere with other traffic or meet an oncoming train unexpectedly. As the car is not long or heavy enough to activate the protective gates at grade crossings, its driver has to exert caution even in rural sections.

When the automobile first went into service observers were startled by seeing it running across country where they knew there was no road, and the police authorities were excited by phone calls about a "lunatic or drunk" who was at large. Now they smile and ignore them.

## Airplane Tires Tested Without Leaving the Ground



### TORTURE TESTS FOR PNEUMATIC TIRES

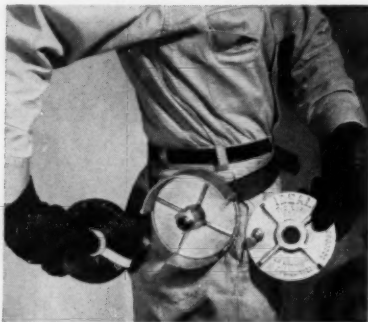
This huge dynamometer enables Goodyear Tire & Rubber Company development engineers to duplicate airplane landing conditions in laboratory testing wheels and brakes. The 113-ton, 14-foot-high machine can simulate loads up to 60,000 pounds at landing speeds as high as 250 miles per hour. It consists essentially of a flywheel to which individual circular plates 10 feet in diameter can be added to increase the weight, as desired. On each side of the wheel is a separate loading carriage upon which a tire, wheel and brake assembly is mounted. By this arrangement one unit is undergoing test while another is being made ready. When the flywheel reaches the designated speed, the tire is "landed" against it by means of a hydraulic cylinder and the brake is applied to decelerate the wheel to a standstill. Automatic recordings of the speed, stopping time, torque, brake pressure and other information are made on the dual control panel shown. It has duplicate instruments to register the separate tests.





## Industrial Notes

Safety, ease of handling and economy are the reasons behind an improved tie-wire reel announced by Ideal Reel Company. The aluminum dispenser, with a brass bushing through the spool for increased wear, weighs only 2 pounds, or about 6 pounds when loaded with a coil



of 14- through 20-gauge black, annealed wire. All parts are interchangeable for replacement. The reel is attached to a belt where, worn on the hip, it does not hamper the movement of the body and is designed so that it can be used by a right- or a left-hand worker. It dispenses the wire in any required length, and there is a rewinding knob that is detachable for safety. With the new device, according to the manufacturer, it is possible to make up to 480 ties an hour and to cut wastage by as much as 33 percent. It is suitable for a wide variety of jobs such as tying reinforcing steel, metal lath and pipe insulation, as well as for wiring shipping cartons, boxes, etc.

Circle 1E on reply card

Two types of hose valves operating on the same principle have been announced by P-K Industries, Inc. Of the venturi-ball type, one is rubber covered and is designed especially for cleaning and filling tanks in the food, pharmaceutical and chemical industries; the other is an air-hose valve for blow applications. Both are actuated by light finger pressure on a plunger which unseats the ball; when pressure is released the valve snaps shut bubble-tight. There are only two moving parts and no springs or levers.

Circle 2E on reply card

Features designed to minimize maintenance difficulties are incorporated in a new line of cast semisteel Y-type pipe strainers developed by Armstrong Machine Works for steam, water, air, oil and gas lines. Straight bushing threads instead of pipe threads facilitate removal of the bushing and stainless-steel screen perforated with 225 holes of 0.045-inch diameter per square inch or made of 20x100-mesh wire cloth or other materials. A copper-asbestos gasket is interposed between the base of the bush-

ing and the body to eliminate gasket blowout. The strainer is available in eight sizes from 1/4 inch through 2 inches.

Circle 3E on reply card

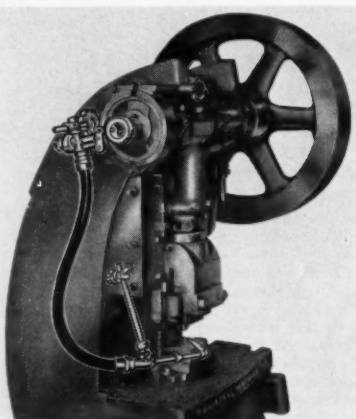
A line of shelving that is manufactured to such close tolerances that components and assemblies are interchangeable is being offered by Standard Pressed Steel Company. The basic unit is said to permit more than 1000 different combinations to meet the needs of well-nigh all storage needs.

Circle 4E on reply card

All the equipment that may be needed to do a thorough furnace, flue and chimney cleaning job is combined in a Tank Pack announced by Ideal Industries, Inc. It consists of a 12-gallon collector tank on wheels, of an oversize filter bag which lets the low-pressure air escape while removing entrained soot and fly ash, of attachments such as nozzles, brushes and scrapers, and of extension rods to provide a long reach. The unit may be obtained complete with a power source or used with the company's hand-type or heavy-duty vacuum cleaner.

Circle 5E on reply card

Using a Pres-Vac to feed a press and ejecting the finished work with an air-blast valve, both products of F.J. Littell Machine Company, make for safety and speed of operations. The feeder, with a reach of as much as 14 inches, is actuated with compressed air at 45 psi, which passes through a venturi to maintain a vacuum of 22 inches of mercury as long as the trigger is pressed. The valve is mounted on the side of the machine and connected by a flexible hose to an adjustable air nozzle which is attached either by a ball and universal joint or rigidly, depending upon whether the press is hand or automatically fed. (Picture shows the air-valve assembly on a hand-fed press.) A 2-piece cam serves to operate the valve, which can be timed



to meet job requirements and adjusted for parts of varying weight. According to the manufacturer, with a 1/4-inch nozzle and air at 50 psi pressure the unit will blow away pieces weighing up to 5 ounces with every turn of the crankshaft; with a 3/8-inch nozzle and 100 psi air it will eject work weighing as much as 2 pounds. Standard, delayed-action and bleeder valves are available.

Circle 6E on reply card

Basic Refractories, Inc., has introduced a new gun designed specifically for the air-emplacement of granular basic refractories in repairing linings in heating furnaces, electric and open-hearth

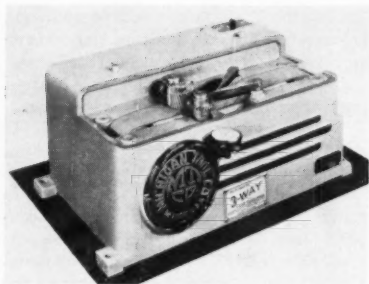


steelmaking furnaces, soaking pits and cupolas. As compared with earlier models, the A-20 is of simpler and more rugged construction and has a hopper of larger capacity (20 cubic feet). Its outstanding feature is an operating platform which facilitates loading and makes the control panel more accessible.

Circle 7E on reply card

William W. Vosper, who designed the first easy-operating pipe-threading tools, died in December. His invention almost halved the time required for hand threading. He founded the Toledo Pipe Threading Machine Company and was chairman of its board of directors at the time of his death. "Toledo" tools are widely used in mines and by contractors for threading the rods used in drilling rock.

To its gravity-type selector for spur or helical gears, which was described in our June, 1954, issue, Michigan Tool Company has added a conveyor type for handling wide-face and cluster gears. As they come from the cutter, each is rotated between two master gears—a rigidly mounted driving gear with two face

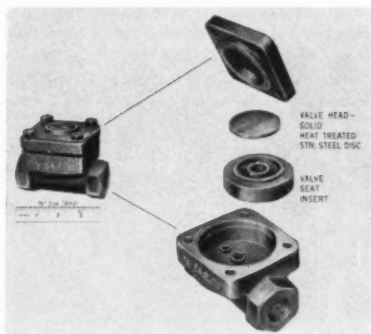


sections and a pivotally mounted driven gear with a single face section. If the work is of the correct size, it is carried along by the conveyor and unloaded at the discharge end; if undersize, oversize or otherwise not according to specifications, the master gears sidetrack it to either the salvageable or reject chute. Like the earlier model, the new 3-way classifier will check all work coming from the highest-speed machine and turn off the latter should an error be consistent.

Circle 8E on reply card

Sand molds for ferrous and nonferrous castings can, it is claimed, be cured in from one to twenty seconds by a European process to be handled in this country by a newly organized Columbus, Ohio, concern. According to *Steel*, it involves mixing anhydrous silicates with the sand and exposing the compacted forms to CO<sub>2</sub> gas.

A steam trap that works on a new principle and without the usual valve-closing devices has been announced by Sarco Company, Inc. It has only one moving part, the valve head—a solid stainless-steel disk—which is seated by the kinetic energy of steam. According to the manufacturer, the Thermodynamic Trap, as it is designated, closes tight on no load and operates against a



back pressure up to 50 percent of its inlet pressure. Condensate is discharged at saturated-steam temperature as rapidly as it forms and large volumes of air or air-steam mixtures can be vented. Starting load capacity is high, but the trap works equally well with light loads or no load. It is designed to operate as efficiently at 1 psi as at 600 psi, is not

affected by pressure variations and virtually eliminates maintenance.

Circle 9E on reply card

As a protection against damage from excessive vibration, The Beta Corporation recommends its new Model 1 Vibraswitch for permanent installation on rotating or vibrating machines, especially on those that receive intermittent or infrequent attention. The device requires no power source or special auxiliary equipment and may be wired by an internal SPDT snap switch into simple control circuits carrying up to 5 amperes to actuate a warning mechanism or to stop machinery the instant vibration exceeds normal by a pre-selected amount. It is said to respond to vibratory displacement increases of less than 10 microinches at the most sensitive setting and to vibratory acceleration from zero to beyond 200 cps (12,000 rpm).

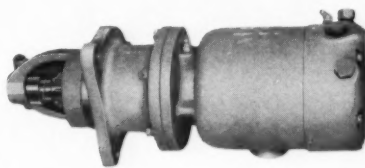
Circle 10E on reply card

Plastic piping systems complete with plastic valves and fittings are a step forward in the handling of corrosive solutions as well as foods and beverages, according to The Lunkenheimer Company. The latter is offering valves and fittings made from Luncor PVC, a strong, rigid-type unplasticized polyvinyl chloride developed by its research

staff. The material is molded to precise tolerances by a special process, is a low heat conductor and nonconductor of electricity and resists most chemicals used in industry. It weighs only a sixth as much as metal. The piping accessories were designed and engineered by Lunkenheimer and are said to insure positive closing. The full line of fittings includes caps, couplings, plugs, unions, reducing bushings, flanges, elbows and tees.

Circle 11E on reply card

Ingersoll-Rand Company, originator of air starting motors for gasoline and diesel engines, has expanded its line by the addition of a smaller size, the 5BM. The motor itself is of the company's Multi-Vane type with sealed bearings to



keep out grease and dirt and is direct connected by a splined shaft to a Bendix drive unit. It is designed for use on gasoline engines ranging in displacement from 750 to 1750 cubic inches and diesel engines from 300 to 700 cubic inches. Like the larger models 9BM and

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Circle 17A on reply card

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When you need large capacity lines to handle air or water on construction jobs, you'll find your best bet is Naylor light-weight pipe. Top performance in either service is built into this distinctive pipe through features not combined in any other light weight pipe.

The lockseam spiralweld structure provides light weight without sacrifice of strength, assuring easier handling and installation. Extra safety is provided by the reinforced spiral truss which acts as a continuous expansion joint to absorb shock loads, stresses and strains, and affords greater collapse strength when lines are operated under vacuum.

For the complete story, write for Bulletin No. 507 covering the complete range of Naylor pipe sizes from 4" to 30" in diameter.



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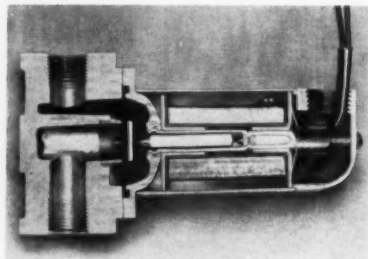
Eastern U. S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Circle 18A on reply card

20BM, the latest size is said to give long trouble-free service because generators, storage batteries and gears are eliminated. Fast, positive starting is insured regardless of temperature conditions.

Circle 12E on reply card

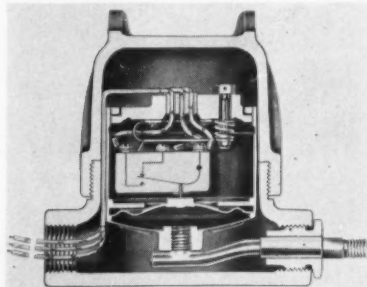
Especially with partial or full automation of metalworking machinery in mind, Eclipse Fuel Engineering Company has designed a diaphragm-operated solenoid valve of simple construction. It has only two working parts—the solenoid plunger and the diaphragm of synthetic rubber. The rim of the latter



serves as a gasket and insures correct alignment of the plunger and valve disk. Known as the DO, the valve is actuated by a pilot with air power which is needed only to lift the plunger. The unit illustrated is one of two incorporated in automatic molding machines for precise control of fluid flow, which necessitates fast cycling with minimum pressure drop and positive shutoff under vacuum of 27 to 29 inches of mercury. It is said to withstand a million cycles without failure and can be serviced without removal from the line.

Circle 13E on reply card

A line of explosionproof vacuum and pressure switches that has been approved for service in atmospheres containing vapors of ethyl, ether, gasoline, alcohol, acetone, petroleum, naphtha, lacquer solvents, as well as natural gas



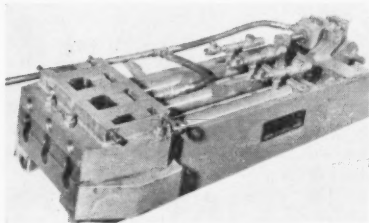
or grain dusts, has been announced by Barksdale Valves. Covering a range from 30 inches of mercury vacuum to 150 psi pressure, they sense increasing or decreasing vacuum or pressure and are said to be extremely accurate, repeating within plus or minus 1 percent of setting. Standard models are available for single or dual settings. The latter type will



secure two different pressure (vacuum) limits and actuate two electrically independent circuits, one ac and the other dc, if desired. Snap action of the switches resets them automatically.

Circle 14E on reply card

To insure positive gripping essential to the efficient operation of cold draw-bench machines, the Aetna-Standard Engineering Company has developed a



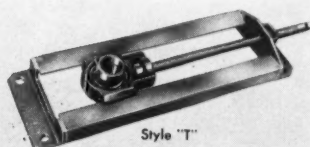
pneumatic carriage gripper and hook. The use of air power for this purpose offers a number of advantages: it permits gripping close to the die stand and because of the smooth action of the carriage and lowering of the hook reduces breakage and cost of maintenance to a minimum. The equipment can be installed on Aetna benches of any size or adapted for machines of other makes.

Circle 15E on reply card

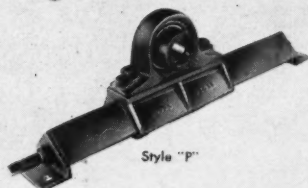
In a recent Montana test of a new mud compound introduced by the Organic Chemicals Division of Monsanto Chemical Company, workers were able to drill an oil well at an average rate of 182.2 feet a day. Called Filcon SPF, it is said to reduce the time normally required to sink a well by at least ten days.

Circle 16E on reply card

Two new take-up bearings—Style P and Style T—have been announced by T.B. Wood's Sons Company. The first, of protected screw design, is for horizontal application and the other for wall mounting. Both are self-aligning and permanently lubricated and can be loaded in tension or compression. They are equipped with standard 200 series MRC



Style "T"



Style "P"

Two-wheeled Ingersoll-Rand GYRO-FLO 210 compressor, powering paving breakers on U.S. No. 1 in New Jersey.



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When choosing construction machinery, always remember that the leading makes of specialized equipment for every operation, from excavation on through final grading, offer the plus value of dependable Red Seal power. And Red Seal means plus value, because every model, no matter in what machine you find it, is engineered with the specific needs of that machine in mind. Red Seal industrial engines—14 to 237 horsepower—are backed by parts and service coast to coast. Look for the Red Seal Trademark on the engine of the equipment you choose.

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INDUSTRIAL GASOLINE ENGINES						
Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.	
N56	4	2 1/4	3 1/2	56	14.2	@ 2200 RPM
N62	4	2 1/2	3 1/2	62	15	@ 2200 RPM
Y69	4	2 1/2	3 1/2	69	21.4	@ 2400 RPM
Y91	4	2 1/2	3 1/2	91	28.5	@ 2400 RPM
Y112	4	3 1/8	3 1/2	112	32	@ 2400 RPM
F124	4	3	4 1/8	124	36	@ 2400 RPM
F140	4	3 1/8	4 1/8	140	42	@ 2400 RPM
F162	4	3 1/8	4 1/8	162	49	@ 2400 RPM
F186	6	3	4 1/8	186	60.5	@ 2400 RPM
*E201	4	3 1/8	4 1/8	201	59	@ 2000 RPM
F209	6	3 1/8	4 1/8	209	68	@ 2400 RPM
F226	6	3 1/8	4 1/8	226	73	@ 2400 RPM
F244	6	3 1/8	4 1/8	244	79	@ 2400 RPM
M271	6	3 1/8	4 1/8	271	86.2	@ 2400 RPM
M290	6	3 1/8	4 1/8	290	92.2	@ 2400 RPM
M330	6	4	4 1/8	330	104.4	@ 2400 RPM
M363	6	4	4 1/8	363	109	@ 2000 RPM
B371	6	4 1/8	4 1/8	371	110	@ 2400 RPM
B427	6	4 1/8	4 1/8	427	127	@ 2400 RPM
G134	4	3 1/8	4 1/8	134	32.2	@ 2000 RPM
G157	4	3 1/8	4 1/8	157	37.7	@ 2000 RPM
H227	4	3 1/8	5 1/2	227	52	@ 1800 RPM
H243	4	3 1/8	5 1/2	243	56	@ 1800 RPM
*H260	4	3 1/8	5 1/2	260	60	@ 1800 RPM
T371	6	4 1/8	4 1/8	371	119	@ 2400 RPM
*J382	4	4 1/2	6	382	74.2	@ 1400 RPM
T427	6	4 1/8	4 1/8	427	140	@ 2400 RPM
U501	6	4 1/2	5 1/8	501	160	@ 2400 RPM
R513	6	4 1/2	5 1/8	513	164.3	@ 2400 RPM
R572	6	4 1/2	5 1/8	572	182.4	@ 2400 RPM
R602	6	4 1/2	5 1/8	602	191.7	@ 2400 RPM
S749	6	5 1/8	5 1/2	749	217	@ 2200 RPM
S820	6	5 1/8	5 1/2	820	237	@ 2200 RPM

INDUSTRIAL DIESEL ENGINES						
Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.	
GD157	4	3 1/4	4 1/4	157	39	@ 2000 RPM
*ED201	4	3 1/4	4 1/4	201	45.8	@ 2000 RPM
HD243	4	3 1/4	5 1/4	243	54.7	@ 2000 RPM
*HD260	4	3 1/4	5 1/4	260	59.3	@ 2000 RPM
*JD382	4	4 1/2	6	382	72.5	@ 1600 RPM
TD427	6	4 1/8	4 1/8	427	106.5	@ 2000 RPM
RD572	6	4 1/8	5 1/8	572	142.5	@ 2000 RPM
SD802	6	5 1/8	5 1/2	802	202	@ 1800 RPM

\*Available for industrial applications only.

**Continental Motors Corporation**  
MUSKEGON, MICHIGAN

ball bearings of the close-curvature type providing maximum load-carrying capacity with no sacrifice in radial space for shaft adapter sleeve. Bearings are locked to shafts by engaging a collar with an eccentric and tightening a set screw. Shaft rotation increases locking action. *Circle 17E on reply card*



#### FORMED ON BIGGEST PRESS

Shown here is an aluminum panel with integral stiffening members for the tail section of the latest U.S. jet planes. It is 23 inches across, the widest aluminum shape ever extruded flat, and was produced at the Lafayette, Ind., works of Aluminum Company of America by what is said to be the largest press of its kind in the world. It can apply a pressure of 14,000 tons to force the metal through the dies. Panels as wide as 34 inches can be made, but these are extruded in the form of a Vee and flattened before shipment.

## QUOTES

—From Here and There

#### No More Frozen Foundry Sand

"When cold weather hits the foundry, molding sand freezes. It has to be heated to be workable. But this winter there will be no smoky salamander stoves at Lackawanna Foundry Co., Lackawanna, N. Y. Electric heating cable laid over the sand will keep it workable through cold nights.

"Each bench molder has one set of Thermwire cable, 80 ft long and rated at 400 watts, to drape on his sand pile. Initial and operating costs are said to be low." *Steel, November 22, 1954*

#### Record-length Conveyor System

"A potash mine in Carlsbad, N.M., will soon be equipped with the longest conveyor system in the United States . . . The present system, installed by Hewitt-Robins in 1952, is 5,800 feet long. The expansion program calls for additional units totaling 32,320 feet, which will increase the length to 38,120 feet . . .

"The record-length 'rubber railroad' will operate 1,000 feet underground in a potash ore seam about four feet thick.

Continuous mining machines will extract the potash ore from the working face of the mine and deposit it on shuttle type conveyors known as Mine-aveyors, which automatically transfer it by intermediate belts to the main line or 'mother' belts. From there the potash will be carried more than five miles to a 3,000-ton underground storage pocket from which it will be withdrawn as needed by a special Hewitt-Robins rotary plow feeder and be delivered to a vertical skip hoist by additional belt conveyors.

"The conveyor system when completed late in 1955 will consist of 45 units linked together to carry the material in a continuous flow from the mining area to the refinery. The rubber belt itself will be about 15 miles long since it is necessary to double the length of the belt to provide for the return run."

#### Boxcar Houses Compressor Plant

"A pair of heavy-duty air compressors capable of supplying a combined volume of 5000 cfm at 125 psi have been put on wheels. Complete with 500-hp electric motors, switchboard, transformers, cooling and lubricating systems, the 138,000 pounds of equipment is fitted into a 60-ft railway box car, hooked to 4160 or 2400-volt power supply and connected to line that will carry air into plant . . . Each compressor is self-sufficient and mounted on steel skids so that entire unit can be pulled out of car for major maintenance. All components are of standard make . . .

"Aside from their value in emergencies, mobile units are expected to effect considerable economies where need for air is temporary. Large industrial concerns with many plants can give all their production lines standby protection with mobile compressors."

*Chemical Processing, November, 1954*



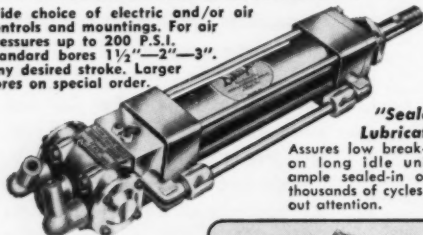
## A COMPLETE LINE OF AIR CONTROL EQUIPMENT

Including precision-made HEAVY-DUTY

### AIR MOTORS

WITH "SEALED-IN LUBRICATION" Pat. Pend.

Wide choice of electric and/or air controls and mountings. For air pressures up to 200 P.S.I. Standard bores 1½"-2"-3". Any desired stroke. Larger bores on special order.



"Sealed-in Lubrication"

Assures low break-away on long idle units — ample sealed-in oil for thousands of cycles without attention.

You Are Invited To Consult Our Engineering Department

freely on all air automation or replacement problems. Trained factory personnel available nationally.

Write for Catalogs and Name of Nearest Lehigh Representative



#### COMBINATION VALVES

Panel units, hand and foot operated valves. Wide range of models.



ENGINEERS & MANUFACTURERS  
1513 Lehigh Drive  
EASTON, PENNA.

"Sealed-in Lubrication"

#### AIR CYLINDERS

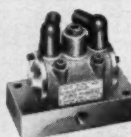
1½" to 8" bore



3 or 4-Way

#### AIR POWERED VALVES

Air or electrically operated. J.I.C. Standards.



#### Lehigh Minor AIR VALVES and CYLINDERS



Low priced, light duty. For air operated jigs, fixtures, high speed operations.



"To tell you the truth, Sweeney, I'm not getting by on mine either."

The second edition of *Compressed Air Handbook* sponsored by Compressed Air and Gas Institute is now available. A practical reference work covering every phase of air and gas compressors, air-operated portable tools, rock drills and other pneumatic equipment, it features hundreds of new illustrations, charts and tables; explains test and maintenance techniques; discusses recent advances in centrifugal and displacement-type compressors; and describes the latest uses of compressed-air power. Published by McGraw-Hill Book Company, Inc., 330 W. 42nd Street, New York 36, N.Y. Price, \$8.00. Copies may be obtained from the Institute or through any of its members.

The Proceedings of the 1954 Basic Materials Conference, which was held in conjunction with the Second Basic Materials Exposition, are available in book form. Entitled *Materials for Product Development—1954*, the 160-page illustrated volume is broken down into six parts: materials of the future; the new metal forming processes; nonmetallic materials; and joining, corrosion and materials management. Most everything new in the field is covered, and all questions and answers presented at the meetings follow each section. Publisher, Clapp & Poliak, Inc., 341 Madison Avenue, New York 17, N.Y. Price, \$7.50.

Bulletin 7096 released by Ingersoll-Rand Company concerns its vertical multistage pumps for boiler-feed, refinery, process and booster service for pressures up to 1500 psi and capacities to 3500 gpm.

Circle 18E on reply card

Firth-Loach Metals, Inc., which specializes in the manufacture of carbide metals, has issued a 20-page catalogue, No. 1, listing its line of Firlomet cemented-carbide blanks for tool and die makers.

Circle 19E on reply card

For the convenience of customers, The Lima Electric Motor Company has published a service brochure which lists the names and addresses of authorized Lima service stations, representatives and factory distributors throughout the United States.

Circle 20E on reply card

Brochure No. 210, obtainable from Stanat Manufacturing Company, shows and describes its line of laboratory and production rolling mills, rotary gang slitters, levelers and accessory equipment. Featured is a mill that can be converted from 2-high to 4-high operation by inserting extra rolls.

Circle 21E on reply card

Bellows Electroaire Valve, a packaged air-control unit, is described in Bulletin AV300R obtainable upon request. Functions are discussed and installation views and schematic wiring diagrams shown. Also includes information about the explosionproof valve of this type.

Circle 22E on reply card

Five related digital instruments, together with their basic components, are illustrated and described in a folder being distributed by Brush Electronics Company. The series consists of a cycling counter, a time-interval meter, a combination counter-timer, a preset counter and a recorder.

Circle 23E on reply card

Properties of and performance and application data on stainless-steel and other metals with controlled porosity for application in the petroleum, chemical, electronic, food and pharmaceutical industries are given in a 45-page brochure issued by Micro Metallic Corporation, a branch of The Pall Filtra-

## Books and Industrial Literature

tion Company. Included is information on various porous stainless-steel filter elements and containers, as well as on complete filter units for immediate pipe-line use. Design and engineering services offered by the company in the application of these materials are outlined.

Circle 24E on reply card

A new line of air-break electric starters for -2200-5000 volt motors is dealt with in Folder 1060 offered by The Electric Controller & Manufacturing Company. Full and sectional views are shown of each style; with 50,000-kva interrupting capacity, with current-limiting power fuses and the Valimitor type for unlimited short-circuit protection.

Circle 25E on reply card

A new automatic stop control for use in place of mechanical snubbing on vibrating equipment such as screens and foundry shakeouts has been announced by Allis-Chalmers Manufacturing Company in Leaflet 07B8141. It consists of a magnetic reversing switch, thermal relay units and pneumatic timers and is said to insure smooth electrical braking action.

Circle 26E on reply card

General Electric Company has issued a 16-page bulletin, GEA-6215, on its complete line of new strongbox industrial solenoids which, power for power, are said to

occupy less space than the earlier models. Features, laboratory tests and general application rules are discussed, and force and current curves are shown for both push and pull types. A cross-reference chart enables users to select the unit that corresponds in force and stroke to the older model.

Circle 27E on reply card

Services such as product design and development, manufacturing cost studies and production engineering offered by Pioneer Engineering & Manufacturing Company, Inc., are discussed in their application to industry in an 8-page brochure, PE-25, that is now available. Included is a list of products Pioneer has handled in the last 25 years.

Circle 28E on reply card

Factual information on its complete line of air and hydraulic cylinders, valves and packaged fluid-power devices is contained in a new 14-section loose-leaf catalogue and data book published by Modernair Corporation. Of 120 pages with provision for the insertion of additional releases, it gives designers and users of these units all the information they require.

Circle 29E on reply card

Information useful to owners of tractors equipped with a 2-drum winch is contained in Bulletin No. 160 obtainable from Sauerman Bros., Inc. Entitled *Long Arms for Your Tractor*, it describes the company's dragline scrapers and slackline buckets for tractors from 40 to 150 hp and includes tables giving maximum span, line speed and capacity in cubic yards.

Circle 30E on reply card



## Simplify Your Coal Storage with a

# ONE MAN

# SAUERMAN MACHINE



Here's how a Sauerman machine solves two of your biggest coal storage problems . . .

- ✓ **PROTECTS AGAINST SPONTANEOUS COMBUSTION . . .** "Layers-in" the coal to prevent voids which form dangerous air-pockets or flues.
- ✓ **PROMOTES BETTER LABOR RELATIONS . . .** Operator is in safe, comfortable position overlooking the work area. A satisfied employee eliminates "FLOATING LABOR".

The drag scraper method is the economical way to handle coal. No heavy equipment moves through the pile, only the Crescent scraper bucket contacts the coal. This reduces power requirements and keeps maintenance costs at a minimum, since no highly machined parts travel the storage area. One man, in a safe location, controls the entire operation, whether it be 20 or 600 cu. yds. per hour.

Learn all the facts from Sauerman's Catalog D . . . Illustrates and describes actual applications in Sauerman's many years of serving the industry.

Write today for your copy.

## SAUERMAN BROS. INC.

648 S. 28th Ave.

BELLWOOD, ILL.

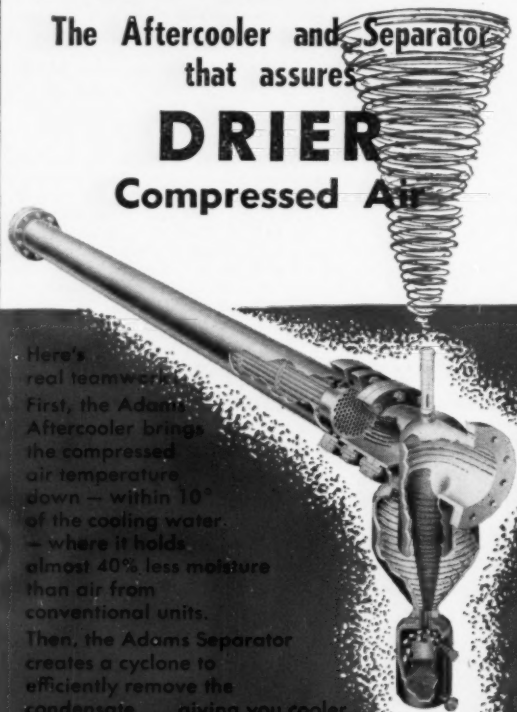


Circle 21A on reply card



# This Adams CYCLONE Saves You MONEY!

The Aftercooler and Separator  
that assures  
**DRIER**  
Compressed Air



Here's  
real teamwork.  
First, the Adams  
Aftercooler brings  
the compressed  
air temperature  
down — within 10°  
of the cooling water.  
— where it holds  
almost 40% less moisture  
than air from  
conventional units.

Then, the Adams Separator  
creates a cyclone to  
efficiently remove the  
condensate . . . giving you cooler,  
drier air for your system.

Thousands in use throughout industry. It will  
pay you to find out all the details. Mail the  
coupon below today.

**R. P. ADAMS CO., Inc.**  
Buffalo 17, New York

**R. P. ADAMS CO., INC.**

209 East Park Drive  
Buffalo 17, N. Y.

Please send my FREE copy of Bulletin #177 on Adams Cyclone  
Separators and Aftercoolers.

Name..... Firm.....

Street..... City..... State.....

C-55

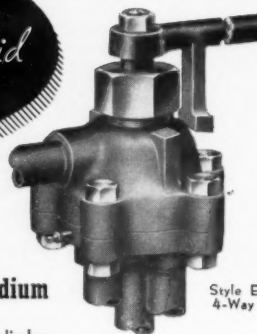
Circle 22A on reply card

Adv. 24

# NICHOLSON

**VALVES**

*for Air & Fluid  
Power*



Style E  
4-Way

**Solenoid, Motor, Lever,  
Foot types for every medium**

Nicholson furnishes valves for cylinder  
control, distributing, metering and for  
many special operating cycles. Installations in a wide range of  
plants have been in constant service for well over 25 years. In  
addition to their long wear and minimum maintenance, Nichol-  
son valves feature: specially treated hard seats and lapping flat  
discs which actually become tighter with use; choice of 6 metal  
combinations to suit your specific service;  
positive protection against grit. Sizes,  
1/4" to 2 1/2". Pressures up to 5000 lbs.

*Send for  
Catalog*

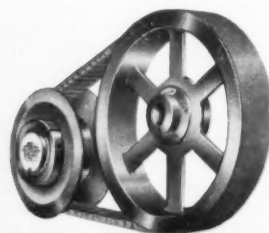
**W. H. NICHOLSON & CO.**

**TRAPS · VALVES · FLOATS**

180 Oregon St., Wilkes-Barre, Pa.

Circle 23A on reply card

**a  
NEW  
smaller  
variable  
speed drive**



**for drives from 1 to 5 hp  
speed range ratio up to 2 to 1**

Here is a small rugged Variable speed drive made with the same  
proven construction of Wood's standard variable speed drives.

Just look at these features!

**DESIGN** — Both flanges move simultaneously by a single adjusting  
screw to change the pitch diameter.

**POSITIVE LOCKING** — Simplified design provides positive clamp-  
ing of the two adjustable flanges eliminating fretting corrosion.

Flanges are quickly and easily released for making speed changes.

**HIGHER EFFICIENCY** — Single wide range belt gives maximum  
HP efficiency. Eliminates problem of maintaining matched belts

and matched grooves for equal power distribution.

**LESS SHAFT OVERHANG** — Single belt design reduces weight  
and space required.

**NO LUBRICATION** — No grease fittings or oil cups, therefore, no  
preventive maintenance needed.

For more detailed information, write to T. B. Wood's Sons Co.  
and ask for Bulletin #497.



**T. B. WOOD'S SONS COMPANY**

CHAMBERSBURG, PA.

Cambridge, Mass.

Newark, N. J.

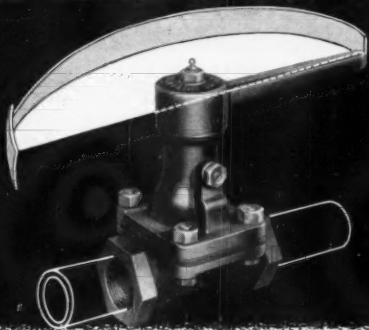
Dallas, Texas

Cleveland, O.

Circle 24A on reply card

COMPRESSED AIR MAGAZINE

with this corrosion resistant valve . . .  
**YOU GO FROM FULL OPEN  
 TO FULL CLOSED IN A  
 180° SWING OF THE LEVER**



**HILLS-McCANN**

*Quick Opening*

**SAUNDERS PATENT DIAPHRAGM VALVES**

Dependent upon materials and size, Hill-McCanna Saunders Patent Valves are suitable for temperatures to 400°F., pressures to 150 psi. Write for descriptive literature.

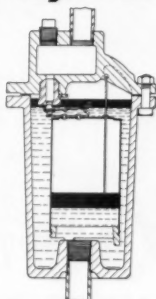
**HILLS-McCANN**  
*Saunders Patent*  
**diaphragm valves**

**HILLS-McCANN COMPANY, 2361 Nelson Avenue, Chicago 18, Ill.**

Circle 25A on reply card

## THIS AIR TRAP is not stopped by oil

NOW you can get dependable, automatic drainage of water from compressed air intercoolers, aftercoolers, receivers and separators even though the compressor is pumping heavy oil. Any oil reaching Armstrong Inverted Bucket Air Traps collects at the top and is discharged ahead of the water.



**Inverted Bucket Air Traps.**

Side-inlet side-outlet styles available.

Armstrong Air Traps have a simple, proven design; there's nothing to stick, bind or clog. Stainless steel mechanism resists corrosion. For pressures to 600 lbs. *Guaranteed to Satisfy.*



**ARMSTRONG MACHINE WORKS**  
 885 Maple Street • Three Rivers, Michigan

SEND FOR FREE BULLETIN No. 2021  
 GIVING DETAILS



**Manufacturers of the well known ARMSTRONG STEAM TRAP**

Circle 26A on reply card

**NEW**

## NORGREN MICRO-FOG LUBRICATORS FOR AIR TOOLS AND CYLINDERS

**variable vane feature provides  
greater flexibility**

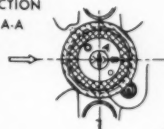
- meet a broader range of operating conditions
- each can handle jobs now done by several sizes of lubricators

A simple adjustment inside the dome provides a wide range of air flow for varying conditions or different applications. For example, at 80 psi the  $\frac{3}{8}$ " size can be set for a flow range of 5 to 9 cfm, a high range of 50 to 100 cfm, or any intermediate range desired.

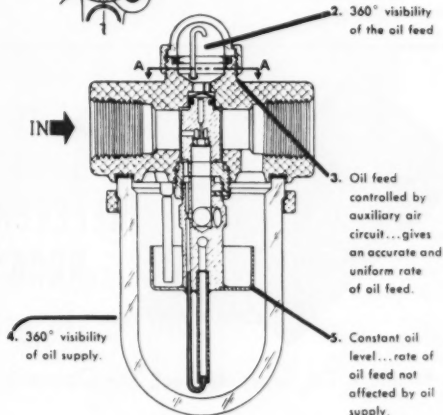
The new line includes 20 models. Flow capacities:  $\frac{1}{4}$ ", 5 to 40 cfm;  $\frac{3}{8}$ " &  $\frac{1}{2}$ ", 5 to 100 cfm;  $\frac{3}{4}$ " & 1", 5 to 250 cfm. Oil capacities: transparent bowl,  $\frac{1}{2}$  pt.; tank type, 1 $\frac{3}{4}$  gal. and 4 $\frac{1}{2}$  gal.

### distinctive Norgren features

SECTION  
A-A



1. VARIABLE VANE VENTURI  
View showing Index Marks "A"  
and "B" for Position of Rotatable  
Vane Type Venturi Plug.



2. 360° visibility of the oil feed
3. Oil feed controlled by auxiliary air circuit... gives an accurate and uniform rate of oil feed.
4. 360° visibility of oil supply.
5. Constant oil level... rate of oil feed not affected by oil supply.
6. Ability to produce a very fine oil fog and deliver it over long distances, through complex piping systems, and obtain equal distribution to multiple lubrication points.

**FOR DETAILS WRITE FOR FORM 496**

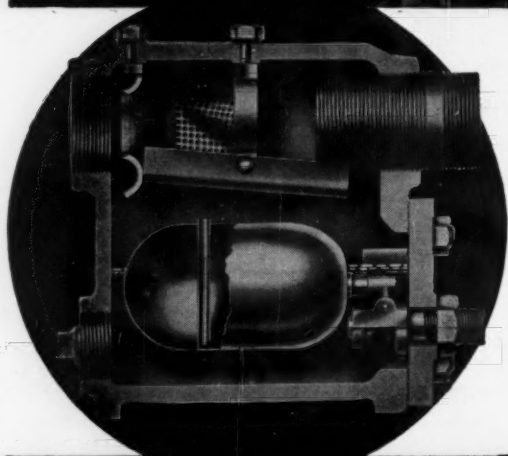


**Oil Fog Lubricators • Pressure Regulators • Air Filters  
Valves • Hose Assemblies**

Circle 27A on reply card

DRI AIR MAY BE INSTALLED BY SUSPENDING IT FROM THE PIPING WITHOUT ANY OTHER SUPPORT.

## INCREASED PNEUMATIC EFFICIENCY WITH THIS AUTOMATIC SEPARATOR



PROTECT EQUIPMENT WITH

# DRIAIR

SEPARATES • COLLECTS • DELIVERS

• DriAir separates and automatically ejects the condensed water and oil from compressed air lines, collects pipe scale and rust, delivers clean dry air to tools and other pneumatic equipment. This promotes better lubrication, reduces wear, increases life of tools and produces greater output. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent.

A TYPICAL INSTALLATION SHOWING DRI AIR STANDING ON A CONCRETE FLOOR NEXT TO THE WALL.

WRITE FOR BULLETIN DA WHICH FULLY DESCRIBES THE CONSTRUCTION AND OPERATION OF THE DRIAIR.

### NEW JERSEY METER CO.

"SPECIALISTS IN COMPRESSED AIR DEVICES"

PLAINFIELD,

NEW JERSEY

Circle 28A on reply card



## TWO HANDY REFERENCE BOOKS

For

The Engineer, The Superintendent, The Operating Man

Cameron Pump Operator's Data.....\$2.00

Cameron Hydraulic Data.....\$3.00

or

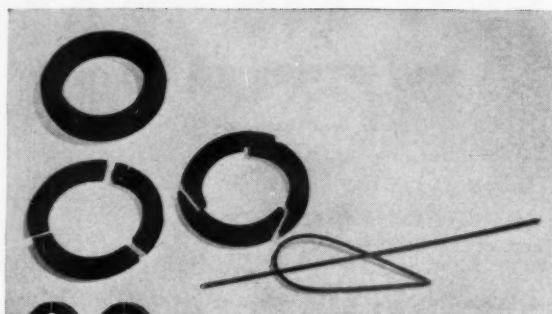
Both For \$4.50.

COMPRESSED AIR MAGAZINE, 942 MEMORIAL PARKWAY  
Phillipsburg, New Jersey, U.S.A.

#### PLEASE SEND ME:

- ☐ Cameron Pump Operator's Data and Cameron Hydraulic Data.....  
Both Books.....\$4.50
- ☐ Cameron Pump Operator's Data.....\$2.00
- ☐ Cameron Hydraulic Data.....\$3.00
- ☐ Enclosed (Money Order) (Check) for \$.....
- ☐ Send Books C.O.D. (U.S.A. only)

Name.....  
Company.....  
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City.....State.....Country.....



## Look to **COOK** for Better PACKING RINGS!

Whatever your packing-ring requirements, you can depend on Cook for a ring design and ring material that will deliver maximum efficiency at minimum cost.

One source, one high standard of quality—that's what you get when you specify Cook—packing-ring pioneers since 1888. Write direct for complete technical data. C. Lee Cook Manufacturing Co., 930 So. 8th St., Louisville 8, Ky.

#### MATERIALS

**GRAPHITIC IRON**  
(Exclusive with Cook)

**COOKMET**  
(No. 1—Plastic Bronze)  
(No. 2—Semi-Plastic Bronze)  
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**BABBITT**  
(Highly Anti-Frictional)

**COOKROC**  
(Laminated Bakelite: Standard, Hi-Temp and Graphitized)

**CARBON**  
(For Non-Lubricated Service)

**C. LEE**  
**COOK**  
MANUFACTURING CO.  
Sealing Pressures Since 1888

Circle 29A on reply card

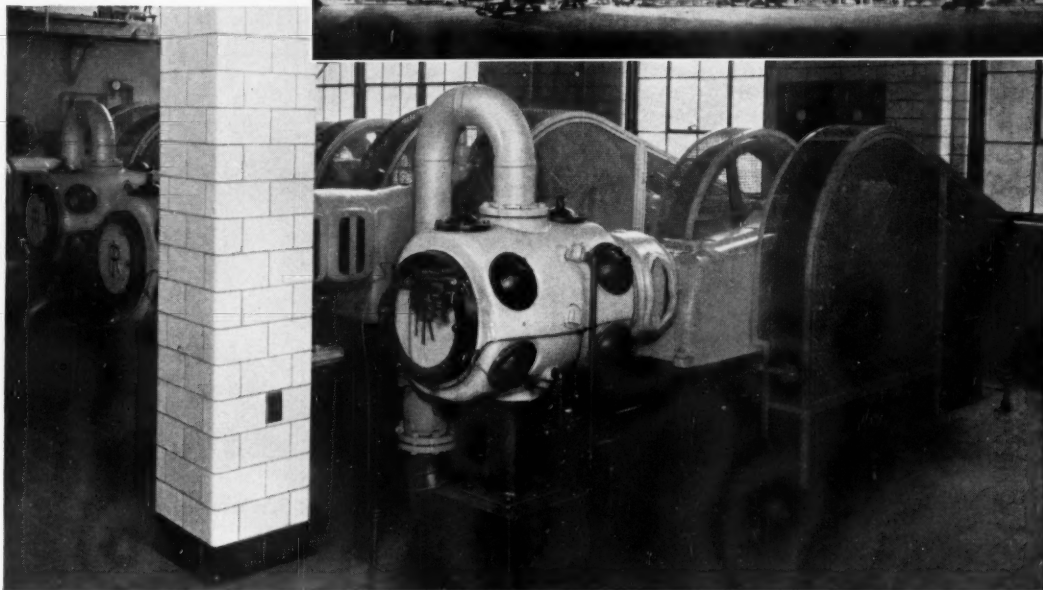
COMPRESSED AIR MAGAZINE



# 20 years of clean OIL-FREE air

at *Schaefer*

**Brooklyn  
Brewery**



## **Ingersoll-Rand Class ES Compressors with NL (non-lubricated) cylinders provide all plant and process air at one of America's largest and finest breweries**

It takes a lot of air to operate a big, modern brewery — air for instrumentation, weighing, conveying, bottle capping, plant maintenance and movement of beer in preliminary processing. And any air that comes in contact with the beer or its ingredients must be *absolutely free of oil*.

The non-lubricated compressor was pioneered and developed by Ingersoll-Rand Company and it was here at Schaefer's, more than 20 years ago, that one of the first of such units was installed. Self-lubricated dry carbon rings eliminate the need for any oil in the cylinder or packing, keeping the air entirely free from contamination. Three more ES compressors with NL cylinders were installed

later, and now all four of them are in daily service as shown in the photo above at the Brooklyn plant of America's oldest lager brewers.

Wherever oil-free compressed air is needed, it pays to specify Ingersoll-Rand NL cylinders. Write or phone for complete details.



**Ingersoll-Rand**  
11 BROADWAY, NEW YORK 4, N. Y.

1-80

ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL & GAS ENGINES

FEBRUARY, 1955

Circle 30A on reply card

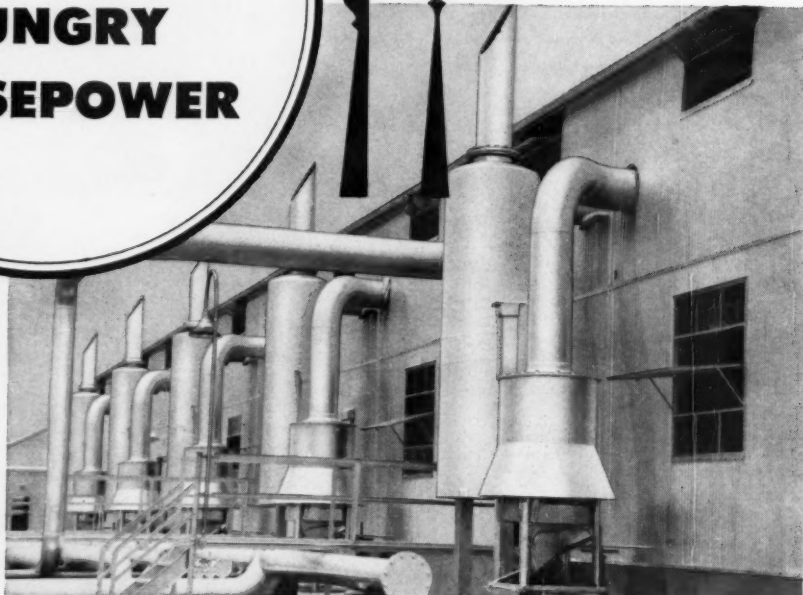
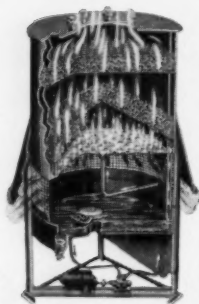
Adv. 27



## DUST-FREE DIET for HUNGRY HORSEPOWER



Clean air for 6750 horsepower! A new, low resistance Cycoil serves each of five 1350 H.P. Cooper-Bessemer engines at Warren Petroleum's Saunders Gasoline Plant, Lea County, N. M.



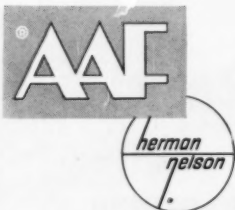
### New Cycoil Oil Bath Air Cleaner combines low resistance with highest cleaning efficiency

**L**OWER the resistance but don't tamper with Cycoil's high cleaning efficiency! A big order but AAF engineers followed your specifications to the letter in developing the new Type "P" Cycoil.

The problem—finding a practical, effective method of impinging air upon the oil at low velocity. The solution—a perforated entrainment plate in the air stream, over which oil flows from a central distributing head. Calibration of the metered orifices in the plate serves to increase the velocity of air flow through the openings to entrain the oil that tends to spill over the edges and distribute air flow uniformly over the filter area. After leaving the per-

forated plate, the air passes upward through primary and secondary filters for removal of its dust and oil content.

The new low resistance Cycoil is available in two types to insure uniformly efficient performance in any desired operating range—(1) Type "P" with standard metered orifices for engines operating from 50% of rated capacity to maximum rating and (2) Type "PV" which, by adding Vari-flow valves to orifice openings, provides sustained high cleaning efficiency from as low as 10% of rating to full capacity. Call your local AAF representative, now, for complete Cycoil data or write direct for Bulletin 160.



# American Air Filter

COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 402 Central Avenue, Louisville 8, Kentucky



# FOR A RECORD BLAST— explosives research pays off



A hill of hard, seamy granite 65 feet high, 100 feet wide, and 600 feet long, located between two sections of a new highway near South Billerica, Massachusetts, was broken to grade level on August 19, 1954, by the largest single blast ever made on a New England highway construction project.

The mound of granite was leveled by a controlled blast (small photo) of 26,400 pounds of Gelamite®

dynamite primed with Hercules® Short-Period Delay Electric Blasting Caps. The excellent fragmentation is apparent in the broken rock pictured above.

Whether your blasting problems are routine or unusual, whether they involve construction, mining, quarrying, or other industrial applications—you can depend on Hercules' experience and knowledge in the manufacture and use of blasting materials to make your job easier.

## HERCULES POWDER COMPANY

INCORPORATED

*Explosives Department, 932 King Street, Wilmington 99, Delaware*

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Calif.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Calif.

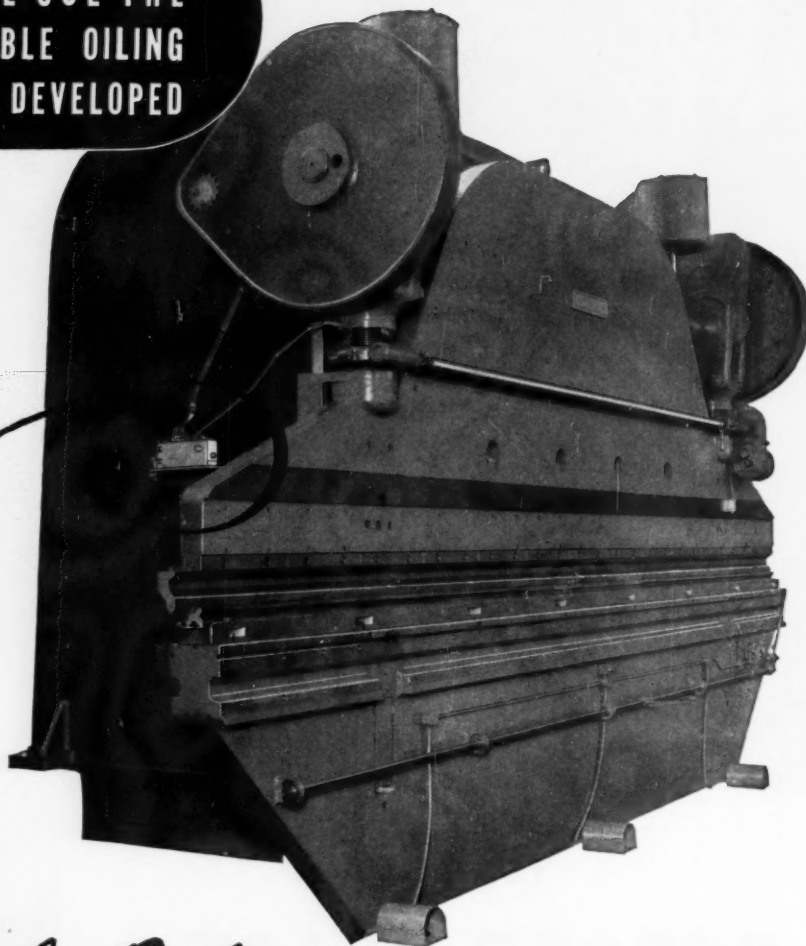


KR53-



**MACHINES OF GREAT  
PERFORMANCE USE THE  
MOST DEPENDABLE OILING  
SYSTEM EVER DEVELOPED**

Illustrated is Madison-Kipp Lubricator Model FD installed as original equipment on a  $\frac{3}{8}$ " by 20' Cincinnati Press Brake, manufactured by the Cincinnati Shaper Co., Cincinnati, Ohio.



**MADISON-KIPP**

*Fresh Oil*

... by the measured drop, from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.

## **MADISON-KIPP CORPORATION**

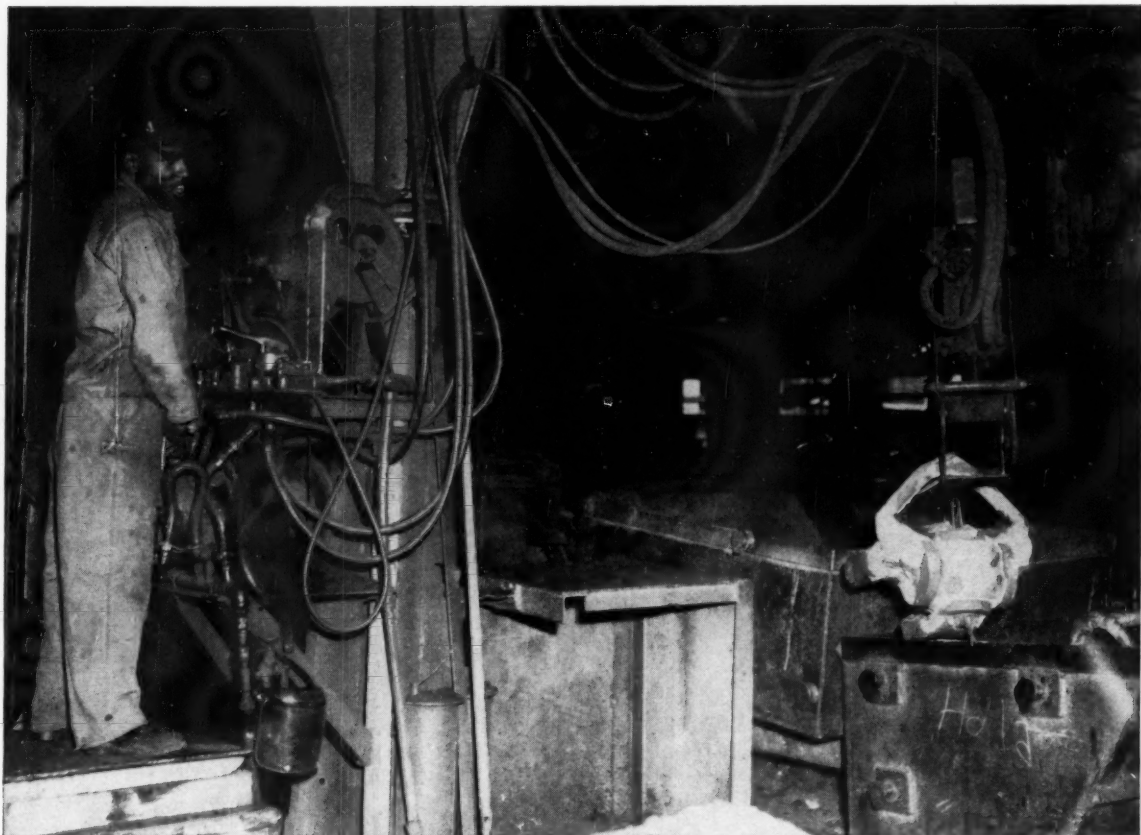
202 Waubesa Street, Madison 10, Wis., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marias, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.



- *Skilled in DIE CASTING Mechanics*
- *Experienced in LUBRICATION Engineering*
- *Originators of Really High Speed AIR TOOLS*



## Air hose with tube and cover of NEOPRENE withstands heat, flexing, oil and grease in plant service

There's no more demanding service for air hose than keeping pneumatic tongs in a foundry from losing their grip. But like all topnotch pneumatic equipment, these tongs are furnished with hose built to take it—hose made with Du Pont neoprene *inside and out*.

**Tough hose covers** of neoprene stand up to severe heat and flexing without cracking as the tongs move back and forth lifting hot castings from a shake-out conveyor. Dragging over rough surfaces won't cause them to chip or tear.

In outdoor service, neoprene covers are just as essential because they stand up to sunlight and weathering. That means *maximum protection for the fabric reinforcement* anywhere air hose is used.

**Smooth neoprene tubes** won't go to pieces when there's hot oil in the line. No particles crumble off to clog vital tool parts. These tubes start smooth . . . *stay* smooth . . . keep the job moving along under the toughest service conditions.

You'll find air hose with cover and tube of neoprene is standard equipment on many pneumatic tools today. Manufacturers know it assures their product of long, trouble-free service. It's the practical choice for replacement hose, too. Ask your supplier to show you neoprene hose the next time you buy.



### FREE! THE NEOPRENE NOTEBOOK

Each issue brings you new, unusual applications of neoprene . . . new products . . . interesting articles. Send in this coupon to E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division CA-2, Wilmington 98, Delaware.

Name \_\_\_\_\_ Position \_\_\_\_\_

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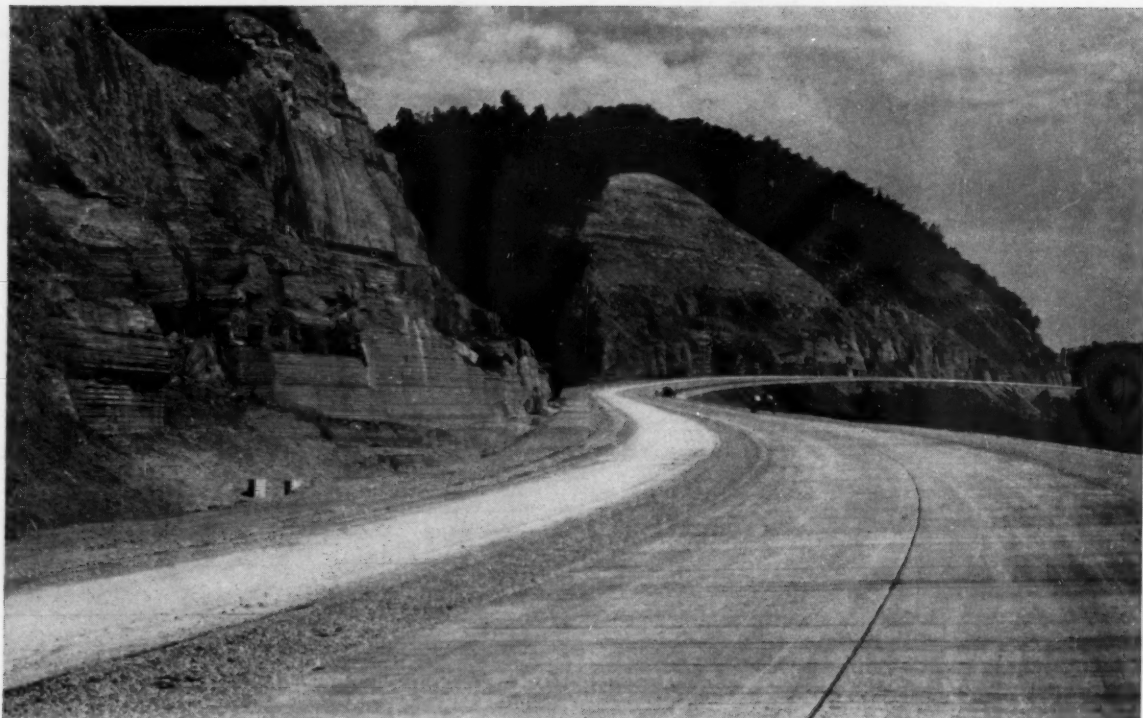
City \_\_\_\_\_ State \_\_\_\_\_

# NEOPRENE

The rubber made by Du Pont since 1932



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



The 88-mile West Virginia Turnpike, built through terrain such as this, affords motorists some of the nation's most breathtaking scenery.

## Removing 250,000 cu yd of Sandstone for West Virginia Turnpike

The motorist driving over the West Virginia Turnpike and struck by its scenic grandeur would never imagine what a herculean job of grading and rock removal made this new highway possible.

Extending 88 miles from Charleston, the state's capital, to Princeton, near the Virginia line, the Turnpike traverses part of the rugged Allegheny Plateau, plus a complex network of winding

streams, canyons and sharply pitched hills—hardly an ideal terrain for road building.

One of the contracts on this super-highway called for removal of some 250,000 cu yd of high-silica-content sandstone about 7 miles north of Princeton. The contractor, Clement Brothers Construction Co., Lenoir, N. C., used wagon drills equipped exclusively with Bethlehem 1¼-in. round hollow drill steel,

fitted with carbide-insert bits. Blast holes ranged to 24 ft in depth. Reconditioning was done by Acme Machinery Company, Williamson, W. Va.

Bethlehem Hollow is generally found in the thick of things in the country's important construction projects. And you can always count on it for the same kind of steady, economical performance it contributed in helping to build the West Virginia Turnpike.



Left to right: Mack Johnson, drill foreman, and Fred Clement, superintendent, both of Clement Brothers Construction Co., with John Persinger, Acme Machinery Co.

**BETHLEHEM STEEL COMPANY**  
BETHLEHEM, PA.

*On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation*



**BETHLEHEM HOLLOW DRILL STEEL**  
**TWO GRADES: CARBON • ULTRA-ALLOY (chrome moly)**





# DRIVE FORM PINS as fast as you can set 'em!

## *with this light-weight I-R Pin Driver*

The Ingersoll-Rand PB-59 Paving Breaker, equipped with a pin-driving fronthed, speeds up the driving of form pins on road building work at least four-to-one, as compared to any other method. One man with a PB-59 can keep up with the pin setter—driving the pins in from 5 to 10 seconds each. What's more, this air powered tool, weighing only 40 lbs. drives the pins *straighter* and *tighter* than could possibly be done by hand.

**The PB-59, with Paving Breaker Fronthead, is the ideal tool for**

- digging hard earth
- backfill tamping
- general demolition work

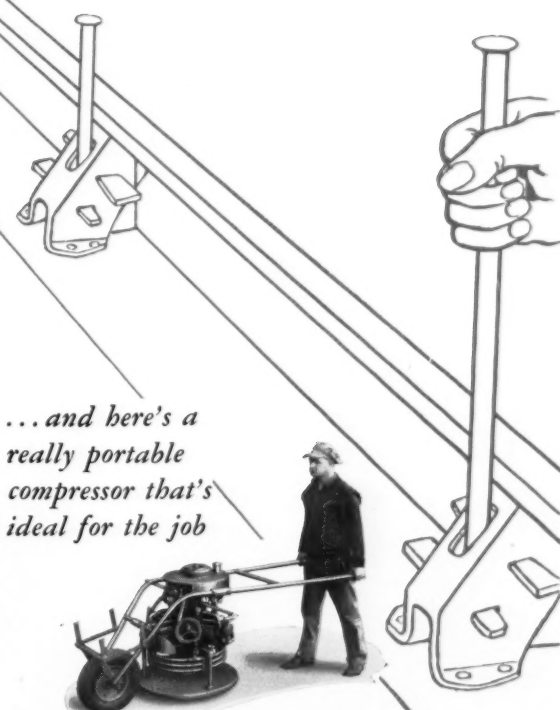


Your nearest I-R representative will be glad to give you complete information on this labor-saving PB-59, or any other item in the complete line of Ingersoll-Rand Paving Breakers and Accessories.

## Ingersoll-Rand

11 Broadway, New York 4, N. Y.

CONDENSERS • GAS AND DIESEL ENGINES • TURBO-BLOWERS • ROCK DRILLS • COMPRESSORS • AIR AND ELECTRIC TOOLS



*...and here's a  
really portable  
compressor that's  
ideal for the job*

## The Ingersoll-Rand SPOT-AIR!

This completely self-contained, gasoline-engine-driven, 36-cfm air-cooled portable compressor, with wheelbarrow mounting, can be easily moved by one man, advancing along the roadbed as the work progresses. It has ample power to keep the PB-59 working at top efficiency—avoids tying up larger compressors that may be needed elsewhere on the job.

5-137

# Better laundry service for hotel with TIMKEN® bearings in compressor

THE type 40 Ingersoll-Rand compressor pictured at the right supplies air for the laundry and machine shop of a large, modern hotel in Texas. It does a dependable job with minimum maintenance. One reason: Timken® tapered roller bearings are used on the crankshaft.

The tapered design of Timken bearings lets them take radial and thrust loads in any combination. Timken bearings keep the crankshaft in positive alignment, reduce wear on adjacent parts. And they carry heavy loads with ease. Full line contact between rollers and races of Timken bearings gives them load-carrying capacity to spare.

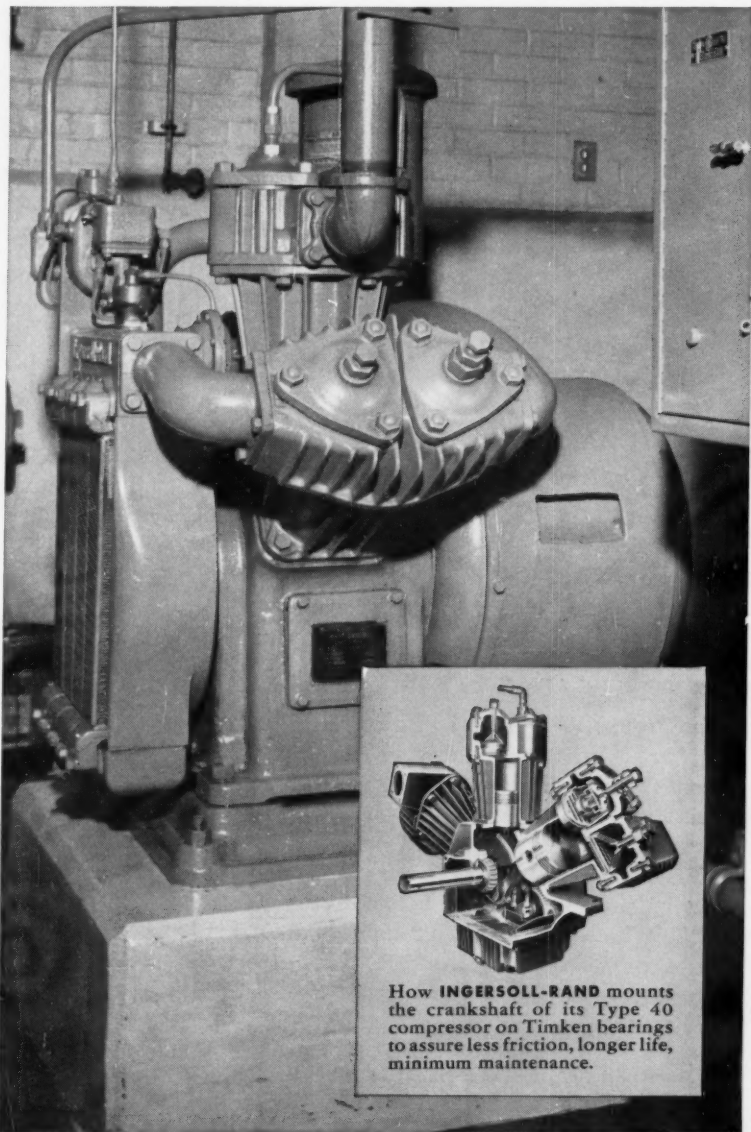
Timken bearings also help prevent costly maintenance delays. By holding housings and shafts concentric, they make closures more effective. Dirt and moisture stay out—lubricant stays in.

Timken bearings practically eliminate friction. They can because they're designed to roll true; and because they're made with microscopic accuracy to conform to their design. And as an extra quality precaution, we even make our own steel. We're the only U. S. bearing maker that does.

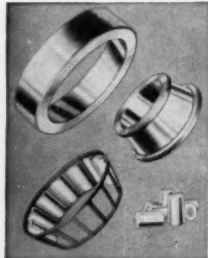
Always specify Timken bearings to make sure you get all these advantages in the equipment you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



*This symbol on a product means  
its bearings are the best.*



How **INGERSOLL-RAND** mounts the crankshaft of its Type 40 compressor on Timken bearings to assure less friction, longer life, minimum maintenance.

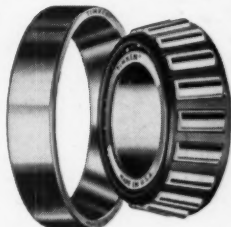


#### DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

**TIMKEN**  
TRADE-MARK REG. U. S. PAT. OFF.  
**TAPERED ROLLER BEARINGS**



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Circle 37A on reply card